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Volume II--Working Papers: Nuclear Power in an Age of Uncertainty

Part 3: An Assessment of Institutional Alternatives for Nuclear Power Generation; Effects on the Nuclear Industry of No New-Plant Orders, 1985 to 2000; Survey of Major National Groups Influencing Public Opinion Against Nuclear Power; Activities of Groups which Influence Public Opinion in Favor of Nuclear Power

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AN ASSESSMENT OF INSTITUTIONAL
ALTERNATIVES FOR NUCLEAR POWER GENERATION

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INTRODUCTION

The establishment of trusted and capable institutions, both private and public, is crucial to the success of any technology, and nuclear technology in particular. In any re-examination of reactor technology, therefore, it is essential to also review the adequacy of those components that make up the institutional infrastructure. The scope of such a review must be explicitly set forth since there is no shortage of institutional issues one could possibly review (particularly if "institutional" is used as a synonym for "nontechnical"). The focus of this review is the nuclear utility, the institution at the center of nearly all things nuclear, at least on the civilian side.

Specifically, alternatives to conventional utility operations are examined in this paper ranging from opportunities for utility self-regulation to eliminating the utility from nuclear power generation altogether. No value judgment is made regarding appropriate action. The purpose instead is to indicate the feasible range of options available explain the nature of each option, and provide an assessment of each option's merits and demerits.

Two appendixes are attached as well to provide the interested reader a broader perspective and context with which to view utility-regulatory interactions. Appendix A briefly describes the disadvantages of overly prescriptive nuclear regulation and seeks to explain the forces responsible for this type of regulation. Appendix B is a characterization of the broad political/institutional environment for nuclear power in this country. It indicates that the number of "actors" involved in nuclear power decision making has increased considerably since the 1960s, and that the achievement of important reforms is contingent upon gaining the consensus of all involved.

SECTION 1: PRIVATE-PUBLIC OWNERSHIP PATTERNS

The belief that civilian nuclear energy would require a novel and unprecedented institutional setting was widespread immediately after World War II.¹ For this reason, the Atomic Energy Commission (AEC) was formed in 1946 and given monopolistic powers over atomic energy development (with oversight by the congressional Joint Committee on Atomic Energy, yet another organizational innovation). The specific reasons why government leaders felt nothing short of a government monopoly was required, were as follows:²

1. fear regarding the spread of atomic weapon secrets (leading to the proliferation of nations possessing atomic weapons)
2. the health and safety concerns associated with the production of nuclear energy
3. the appropriateness of government control pending on-going negotiations for international control of atomic energy development (the Baruch Plan)
4. the uncertain technological factors that made government control a matter of "prudent stewardship"
5. the importance of uninterrupted fissionable material production which was more likely to be assured under government control.

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The case for complete government monopoly began to appear less compelling during the late 1940s. The Soviet Union rejected the Baruch Plan, thereby eliminating any hope of firm, international control over the atom. Equally significant, the Soviets demonstrated that they too could produce atomic weapons. Considerable progress into reactor design and development was made during this period and it was shown that with proper precautions, the radioactivity generated in the normal utilization of the technology did not represent an imminent threat to the public's health and safety.

As a result, several private enterprises began to discuss with the AEC the possibility of participating in nuclear energy development in a more standard commercial fashion than allowed under the 1946 Act. Under the AEC monopoly, private enterprises and academia were enlisted in the research effort, but only on a contract basis. It was the AEC itself, which selected the organization to contract, and which determined the terms of

the relationship. With the initial stages of commercialization drawing nearer, the AEC began to study possible changes in the law which would allow a more normal government-business relationship.

In 1953, the chairman of the AEC, Gordon Dean, testified before the JCAE and recommended new legislation that would permit among other: ownership and operation of nuclear power facilities by groups other than the AEC; lease or sale of fissionable material under safeguards; and more liberal patent rights. Commissioner Dean argued that such changes in the 1946 Act were essential to create the "favorable atmosphere" necessary to spur both competition and the development of the technology.³ In other words, it was perceived that allowing private enterprise to own and construct nuclear facilities, as well as have normal commercial rights, would hasten the day when nuclear energy would be competitive with other forms of energy. The prospect of the United States losing its preeminence in the nuclear energy field by not enacting new legislation was evoked throughout Congressional hearings in the early 1950s.

Interested industrial representatives strongly seconded Commissioner Dean's proposals which would open the door to commercial enterprises. While no one promised that competitive nuclear energy was just around the corner, there was consistent sentiment expressed that only through "normalizing" the institutional structure of the potential industry could the necessary steps be taken to make it competitive in the foreseeable future. The burning issue of the mid-1940s--i.e., the possible proliferation of countries possessing atomic weapons--was scarcely raised in Congressional hearings. There was even less discussion of private enterprise's ability to assume the risks and responsibilities of protecting the public's health and safety.⁴ The result of the hearings, of course, was the landmark Atomic Energy Act of 1954 which was the key to the development of an institutional framework more congruent with the nature of American commercialization.

The Atomic Energy Act alone did not produce the institutional milieu we see today. The government after 1954 continued to play a very significant role in commercializing civilian nuclear energy. An initial reluctance of electric utilities to play the key ownership and operational roles in the nuclear field was eventually overcome by such government actions as:

a series of subsidized power demonstration programs in the late 1950s and early 1960s; the Price-Anderson Act, which limited the public liability of utilities in the event of a nuclear accident; an ambitious AEC research and development agenda carried out at selected national laboratories; an active AEC promotional mandate; and Admiral Rickover's successful use of nuclear powered submarines. These government actions, along with "turnkey" arrangements offered by the major nuclear vendors in the 1960s, finally convinced a large number of utilities that nuclear power was indeed an attractive option for producing electricity.

The commercial institutional structure that evolved in the late 1960s, in response to government and industrial incentives is essentially the institutional structure we see today. It consists of a mix of private and public institutions across the entire fuel cycle. Mining, milling, and fuel fabrication are carried out by privately-owned institutions. Fuel enrichment, however, is still the exclusive domain of the federal government. President Ford's proposal to admit private industry into the enrichment business was narrowly rejected by Congress in 1976 (some within the Reagan Administration favor reviving the Ford proposal, but there is scant chance of it appearing on the busy legislative agenda without an unlikely push by industry). Generation, of course, is carried out by electric utilities, a mixture of investor-owned and publicly-owned entities. Some of these utilities serve as their own constructors, but more frequently contract with privately-owned architect-engineers (AEs) to design and construct the large majority of the generating facility. There are at least 12 AEs today that can perform this role for utilities. In addition, reactors are designed and supplied to the utilities by four privately-owned vendors (i.e., Westinghouse, General Electric, Combustion Engineering, and Babcock & Wilcox). The back end of the fuel cycle is still undeveloped institutionally. There have been several aborted private sector reprocessing initiatives, and civilian reprocessing of spent fuel is not being carried out today on a commercial scale. Finally, utilities dispose of low-level nuclear wastes at a few existing regional (state- or federally-owned) sites, while high-level waste disposal remains in abeyance until the sites and methods for disposal are selected by the federal government.

Despite the anomalies that still exist, such as dominant government involvement in enrichment, research and development, and waste disposal, nuclear energy has essentially been incorporated within the familiar institutional framework of the regulated electric utilities. No new or novel institutions have been created to supplant utility exploitation of the atom. This is not to say, however, that the current institutional make-up of the industry is the only conceivable path that could have been followed or that it is the optimum path even today. An example of the large diversity of ownership patterns possible can be seen in Table 1, which indicates the various public-private ownership patterns currently found in several

Table 1. Patterns of Ownership in the Nuclear and Electric Utility Industries

	USA	Japan	FR Germany	Sweden	Canada	France	UK	USSR
Enrichment	S	m	m	-	-	S	S	S
Fuel fabrication	P	P	m	m	P	m	S	S
Electric utilities	m*	m*	m	m*	(S)	S	S	S
Architect engineering	P	P	P	m	S	S	S	S
Reactor supply	P	P	P	m	S	m	m	S
Reprocessing	-	-	-	-	-	S	S	S
Waste disposal:								
R&D	S	S	m	m	S	S	S	S
Implementation	m	m	m	?	S	S	S	S

Key: S = state (central government ownership)
 (S) = state (provincial government) ownership
 m = mixed private and state (central and/or provincial ownership)
 m* = mixed ownership, in the sense that some institutions are privately, others publicly owned, e.g., in the USA, 77% of electricity is generated by private utilities, 23% by public utilities
 P = private ownership
 ? = undecided
 - = not taking place on a commercial scale

Source: Adapted from David A. Deese, "A Cross-National Perspective on the Policies of Nuclear Waste," in *The Politics of Nuclear Waste*, E. William Colglazier, Jr. (ed) (Pergamon Press, 1981) (adapted from Mans Lonnroth and William Walker, "The Viability of the Civil Nuclear Industry," a report for the International Consultant Group on Nuclear Energy, 1980).

countries. Even within the democracies there are significant differences in public and private ownership patterns. France, for example, has structured its nuclear industry in a far different fashion from the dispersed and largely privately-owned nuclear industry in the United States. France has a single nationalized utility to deploy and operate its nuclear facilities, a single (mixed ownership) reactor vendor and only two state-run architect engineers. Canada and the UK also have rather consolidated and government-run nuclear industries. These examples are given not to imply that the United States should necessarily follow the lead of other countries, but simply to illustrate the wide range of ways nuclear power can and has been institutionalized.

Utility Management

Few, if any, of the utilities that ordered nuclear plants in the 1960s or early 1970s were prepared for the extraordinary demands this technology and its regulators would make upon them. Because of the concern over possible high consequence accidents, development of the technology has not been allowed to advance through ordinary trial-and-error practices.⁵ The effort to ensure safety, in the absence of trial-and-error experience, has, therefore, required that utilities apply unparalleled dedication and vigilance to the management of constructing and operating nuclear facilities. Most utilities have proved able to meet the challenge, and, indeed, the safety record of the entire industry is salutary. Yet it is widely known that not all within the nuclear/electric industry are equally competent, or equally dedicated to personally ensuring high degrees of safety. There could be several reasons for this disparity, such as: (1) a dilution of the "pioneering spirit" and a fragmentation of perspectives and capabilities over time such that no one now brings a holistic perspective to the enterprise;⁶ (2) the continuing willingness of some utilities to rely upon vendors and AEs for their source of expertise;⁷ (3) an additional willingness to delegate safety responsibility to the NRC; and (4) a continuing belief by some, that public and regulatory fears are overblown and that the benefits associated with constant vigilance and quality control are out-

weighed by the costs: in other words, an absence of total commitment to quality assurance.

The discrepancy among utilities and nuclear suppliers in their capabilities and dedication to safety, is not unique to either these organizations or the nuclear power field. In a recent book entitled, Going By the Book: The Problem of Regulatory Unreasonableness, Bardach and Kagan claim that roughly 80 percent of the firms being regulated by health and safety agencies (across the board) are conscientious and capable organizations ("good apples"), whereas 20 percent are not ("bad apples"); and that it is 10 percent of the firms that cause 90 percent of the problems.⁸ Though these rough statistical generalizations may not precisely reflect reality in the nuclear business, the principle reflected in the statement is probably still valid.

Whereas the existence of "bad apples" in most other fields is tolerable, though not desirable, their continued existence in the nuclear business is not. Even the most trivial of transgressions are reported in the media and inspire concern among a public attuned to worst-case scenarios and not able to distinguish between significant and insignificant events. A steady stream of media events will seriously erode public confidence in the technology. Regardless of how fair or justified it is, the nuclear industry is and will continue to be required to perform to standards far in excess of those required of most other industrial activities.

There is yet another reason why lax performance in the nuclear business cannot be tolerated: namely, that it requires the NRC to play a more dominant and prescriptive role in assuring safety than is reasonable or desirable. NRC Commissioners Gilinsky and Asselstine have claimed that the nuclear/electric industry is being "held hostage" by its weakest links.⁹ In other words, nuclear regulation that is being targeted toward shoring up the efforts of the weakest performers, must, in many cases, be legally applied in a nondiscriminating manner to the better performers as well where it is least applicable. This development, unfortunately, contributes to the adversarial relationship that now exists between the industry and its regulators (regulatory problems are discussed in the appendix to this paper).

Despite the widespread recognition of varying management capabilities and dedication to safety, there is no universally-held answer for producing uniformly high performance standards. Several suggestions exist, however, and these will be explored throughout this paper. Extensive, but by no means exclusive, use has been made of the report produced by the International Energy Associates Limited in 1979, entitled Institutional Options for Nuclear Power Generation in the United States.¹⁰ As in that report, various options will be described and evaluated with respect to their anticipated feasibility, effectiveness, and acceptability. No assessment of the overall desirability of these options will be made in this paper, as this will be left to the reader's judgment.

The discussion of institutional alternatives or options will be placed within the following framework:

Alternatives Possible Within the Present Institutional Structure

- Self-Regulation
- Nuclear Service Companies

Alternatives Requiring Major Institutional Changes

- Utility-Owned Regional Nuclear Power Company
- Government-Owned Nuclear Power Authority

The four alternatives to be reviewed do not exhaust the number of possible alternatives to current practice, but do represent a significant range. Restructuring of the entire electric industry--from deregulation to nationalization--is not considered in this paper.

SECTION 2: ALTERNATIVES POSSIBLE WITHIN THE
PRESENT INSTITUTIONAL STRUCTURE

Speakers at industry-wide meetings frequently claim that utility (and the larger nuclear industry) performance and commitment to safety has increased considerably since the Three Mile Island (TMI) accident. The financial hardships that have befallen GPU since the TMI accident have reportedly made a strong impression upon utility executives. The incentive these executives feel for "investment protection" is now seen as both apparent and real.¹¹ It is, unfortunately, impossible to quantify these assertions to reveal their validity. One can point, however, to specific actions that have been taken since the TMI accident that lend credence to the claim of greater commitment to safety. These actions include:

1. The establishment of the Institute of Nuclear Power Operations (INPO)--This organization was established--in part as a response to Kemeny Commission recommendations--to upgrade utility operating performance using the cumulative base of experience that has been gained already. All nuclear utilities have become participating members in INPO as well as some suppliers. More will be said about INPO in the section under self-regulation.
2. The establishment of the Nuclear Safety Analysis Center (NSAC)--Formed to conduct a technical review of the TMI accident, this organization now conducts research on low-probability accidents and generic safety questions.
3. The initiation of insurance coverage for replacement power purchases--An insurance pool was established--The Nuclear Electric Insurance Limited (NEIL)--to cover the potentially large replacement power costs that could arise from an extended outage. Premiums for utilities run from \$1.5-2 million/year per reactor, and the coverage now amounts to approximately \$180 million.
4. Internal utility reorganization giving more importance to nuclear energy expertise and technical support--It is reported that several utilities have upgraded their commitment to nuclear power since the TMI accident by promoting nuclear experts to top management positions.¹² This has usually been accompanied by an increase in the technical support being devoted to plant operations (some claim that on-site utility personnel have doubled in number from pre-TMI accident days).
5. The formation of Nuclear Utility Task Action Committees (NUTACs)--The utilities have periodically formed ad hoc committees to review various safety issues and produce a common utility position vis-a-vis the NRC. Such issues as emergency operating procedures and control room designs have been the subject of NUTAC review thus

far. This united utility approach to safety issues contrasts with the passive or fragmented approach commonly practiced by utilities in pre-TMI accident days.

6. Financial support of the Industry Degraded Core Rulemaking Program (IDCOR)--Over 60 utility and utility suppliers are financing the large-scale IDCOR research effort, searching for optimum rules or plant designs for dealing effectively with degraded core and core melt accidents.¹³

Because of the heightened activity just described, it is possible for the first time to conceive of a nuclear regulatory regime that is imposed from within (industry self-regulation) as well as from without (the NRC). While it is inconceivable that the NRC would be removed from its statutory duties, it is possible to envision the NRC operating in a less prescriptive (more performance-based) manner than in the past, due to industry self-regulating practices. Since this opportunity is receiving a good deal of discussion, it will be dealt with in more depth than the other institutional options that follow.

Self-Regulation

The institutional focus for discussions of self-regulation has been INPO. As noted previously, INPO was established in the wake of the TMI-accident and charged with conducting programs that would improve the operating performance of the nuclear utilities. The Atlanta-based INPO has made impressive strides since its founding just three years ago. Among its accomplishments are the following:

- The establishment of a system for gathering and evaluating operating experience at each reactor, and then communicating the "lessons learned" to all utilities.¹⁴ INPO collects and evaluates operational data sent to them under the auspices of two major programs, the Significant Events Evaluation and Information Network (SEE-IN) and the Nuclear Plant Reliability Data System (NPRDS). The former program also involves NSAC. These are attempts to learn from the cumulative base of experience already achieved. The data base not only includes U.S. utility event reporting, but also that of most foreign utility experience as well (covering approximately 80 percent of the operating reactors worldwide). The results of these evaluations are made available to utilities

through such means as an electronic teleconferencing system (NUCLEAR NOTEPAD), and through the dissemination of "good practices" papers or reports ("benchmarks of excellence") telling what some utilities have done to cope with common problems.

- The on-site evaluation of performance at all nuclear utilities. INPO sends review teams to conduct periodic and in-depth reviews of utility performance. The results of each review, citing areas where improvements could be made, are discussed with utility executives, and included in a written report.
- The establishment of utility employee training (and qualification) guidelines, and job evaluation criteria.
- An examination of utility emergency preparedness plans.
- A program to develop industry-wide certification of radiological protection training.
- Begun to produce performance objectives and criteria in nuclear facility construction.

The reception to INPO activities among the utilities and the NRC is difficult for an outsider to gauge. E. P. Wilkinson, President of INPO, claimed in a recent speech that INPO has been gradually gaining the credibility it needs to successfully interact with the utilities and the NRC.¹⁵ Nuclear utilities, of course, are a diverse group of organizations and it would not be surprising if INPO were valued more by some than others. Individual utilities have tended to function as rather insulated organizations in the past and the collective spirit of the INPO endeavor may be difficult for some to accept. The NRC appears to be evaluating INPO programs on an ad hoc basis, but, in general, has seemed to welcome INPO initiatives. There has, for example, been a memorandum of agreement signed between NRC, INPO, and NSAC regarding the exchange of information relating to event reporting systems. The NRC has reportedly deferred initiating its own reporting system in light of this agreement. The NRC has also agreed to limit its own on-site utility evaluations, in deference to INPO site visits. Discussions between INPO and the NRC are now underway in such areas as emergency response, radiation protection, construction quality assurance, and accreditation of training programs, to facilitate the coordination of efforts and eliminate duplication. In short, the NRC

generally appears open to modifying its own efforts in specific areas when it can be convinced of the merits of INPO's activities.

As impressive and salutary as the INPO efforts have been, thus far, it remains to be seen as to whether INPO is actually performing a regulatory role. INPO's efforts have primarily been devoted to identifying good industry practices, and in communicating these practices, free of any coercion, to the nuclear utilities. The success of this modus operandi in bringing all nuclear utilities up to a high standard of operation seems to be predicated upon three key assumptions: (1) that the utilities have the technical capabilities to assimilate the "lessons learned" being passed on by INPO; (2) that the utilities are organized to receive and evaluate INPO recommendations in light of their relevance locally; and (3) that the utilities have sufficient motivation to implement INPO recommendations in light of their added costs. Until we have greater certainty that these assumptions are indeed true, we do not know, in fact, whether regulation or simply technical assistance is taking place.

INPO can only be as strong a leader and regulator as the utilities wish it to be. At the current time, utilities retain the right not to release INPO utility performance evaluations to the public or the NRC. The vast majority of utilities have made these evaluations public; yet the fact that INPO is beholden to utility veto power indicates its tenuous status as industry regulator. Furthermore, a possible link (discussed early in INPO's history) between utility certification by INPO and the utility's eligibility for replacement power insurance, has yet to be made. It may be that INPO's role as industry regulator will evolve and grow stronger over time. It would be unrealistic, however, to expect NRC regulation to change or diminish significantly on the basis of INPO's efforts thus far. The public clearly supports strong regulation of nuclear power, and will not be assured of INPO's effectiveness without a convincing demonstration.¹⁶ The attentive public will no doubt echo the sentiments expressed by one scholar of regulatory affairs who stated "An industry self-regulation program based upon voluntarism without sanctions is little more than a PR pep talk for the industry."¹⁷ The onus, therefore, is on INPO to demonstrate that through its efforts regulation is indeed taking place, and can be carried out in lieu of (not in addition to) prescriptive NRC regulation.

The key to demonstrating that self-regulation is taking place is in the establishment of a self-imposed system whereby utilities are rewarded for good performance and penalized for bad. As just mentioned, it might be appropriate to link INPO certification with utility access to insurance. Premiums and coverage might be scaled according to the actual performance of the firm, not unlike personal automobile insurance or the approach used by fire underwriters in their assessment of and coverage to municipal fire protection units.¹⁸ An even clearer and more powerful demonstration of INPO's seriousness would be a recommendation that public utility commissions use INPO evaluations in the determination of a utility's rate of return on investment; or in convincing Wall Street to use the evaluation in its determination of utility bond ratings. What is being suggested is a new structuring of incentives so that it clearly pays utilities to upgrade and maintain the highest performance standards possible.

In short, INPO appears to be a very positive force in assisting those utilities that are both willing and able to learn from the universe of operating experience. INPO's ability, as an industry regulator, to grab the attention of all nuclear utilities, however, has yet to be demonstrated. Some pros and cons of the self-regulation approach in general are given below:

Pro

- With industry self-regulation, the NRC would be able to function in a less prescriptive manner. The responsibility for safety, now disproportionately in the hands of the NRC, would be more properly shared.
- Industry evaluations of safety, based upon "hands-on," practical experience are likely to be more valuable than NRC evaluations, where compliance with regulations is commonly asserted to be the measure of safety.
- Industry self-regulation would promote a necessary sense of togetherness in the nuclear enterprise in what heretofore has been a rather disconnected industry.

Con

- Unless the NRC recognizes the benefits of industry self-regulation, the result could be still another layer of regulation that the utilities would be expected to comply with, in addition to current layers.

- Equally disturbing as the above concern would be if the NRC were to abrogate its responsibility for safety in light of self-regulation. Self-regulation should lead to a different kind of NRC regulation (more goal and performance-based than legalistic and prescriptive), not an absence of federal regulation. Finding the right balance between NRC and industry regulation could be difficult.
- In the absence of clear signals or manifestations, self-regulation would be viewed with suspicion by much of the public. Public support for firm regulation of the nuclear industry is apparent.
- The opportunity for industry "capture" of its own regulators would appear greater than the capture of an independent NRC. In other words, industry fervor for self-regulation could erode over time.

Service Companies

The establishment and utilization of service companies, designed to bring a broad spectrum of technical and managerial expertise to utility nuclear operations, could be an important institutional innovation. The possibility of forming service companies to bolster nuclear utility performance was raised frequently by various Kemeny Commission members and has been discussed in various publications since the TMI accident. The sources used to describe service companies in this paper are primarily the report entitled, Institutional Options for Nuclear Power Generation in the United States, and the discussion by Leon Ring in the recorded workshop proceedings, An Acceptable Future Nuclear Energy System.¹⁹

The use of service companies would not stand in contradiction to the self-regulatory regime just described; they could, in fact, be quite consistent and mutually supportive. Nuclear utility use of service companies has been envisioned up to this time as being completely voluntary. Mandatory use could conceivably be required by the NRC, subject to state PUC acquiescence. PUCs would look carefully at utility-service company contracts to assure that ratepayers are not being unnecessarily burdened by this arrangement. If the financial incentives for safe control and operation of nuclear facilities were modified through such means as described previously, it would not be surprising to find some utilities actively seeking out service companies.

Nuclear service companies would be individual corporate entities that would be employed solely by nuclear utilities to carry out specific, on-site technical and managerial tasks related to the construction and operation of nuclear facilities. Utilities would retain ownership, financial, and liability responsibilities, but would delegate safety responsibilities in selected areas. Service companies would be given complete control for the tasks delegated by utilities. The scope of the tasks conducted by service companies would be left to utility discretion; these tasks could run the gamut from narrow, focused jobs to full and complete operational responsibility. This might involve such tasks as: (1) handling licensing interaction with NRC (it is envisioned that the service company itself would have to be licensed by NRC or INPO); (2) systems design and engineering integration; (3) operational and maintenance tasks; (4) fuel procurement; and (5) quality assurance. Whatever the tasks, the essential purpose is to make the best expertise in this field available to the utilities, which up to this time have had to rely upon in-house staff.

Who might establish nuclear service companies is unknown at this time, but it would not be unusual if high-technology corporations or large and capable utilities, themselves, would form them if they foresaw a demand for such companies. In order to attract the very best in the business they would have to offer attractive career opportunities. In the thinking that has been advanced thus far, service companies would be expected to operate on a regional basis, working for as few as 6 utilities or as many as 30. Utilities would offer service companies relatively long-term contracts and provide compensation on a cost-plus-fee basis.

While the accounts of possible service company formation have tended to emphasize the benefits from these companies being responsible for operational and maintenance tasks, service companies might first establish their niche in the construction part of the business. As new institutional actors, service companies could perform a useful role in integrating and overseeing the work of nuclear vendors and architect-engineers--a task which many utilities have not give sufficient importance to in the past. This deserves some explanation and discussion.

Frequent mention is made of the fragmentation of responsibilities among the major elements in the nuclear industry; namely, that the utili-

ties, reactor vendors, and architect-engineers all have specific responsibilities, but that none of these groups has played the role of integrator, ensuring the necessary and proper interfacing of group tasks.²⁰ As owner and licensee of the finished facility, the utility is probably best positioned to play that role. Unfortunately, many utilities have been exceedingly passive, deferring to the judgments and expertise of others. The Kemeny Commission, in light of this shortcoming, stated "There must be a single accountable organization with the requisite expertise to take responsibility for the integrated management of the design, construction, operation, and emergency response functions."²¹ The service company has the potential to be this organization. It could expertly assess reactor design alternatives, optimally match reactor characteristics with balance of plant considerations, and ensure--through a quality assurance program--that the constructor's performance matches his promises.

In view of serious quality assurance deficiencies that have become evident recently in the construction of several nuclear power plant (e.g., Zimmer, Diablo Canyon, South Texas, Marble Hill), a service company formed and hired for nothing more than conducting independent audits of nuclear facilities might be a welcome innovation. Since safety must above all be built into a nuclear facility, it is probably at least as important that service companies be retained for assistance during the construction phase as it is for their assistance during the operational phase.

Service companies are rather commonly used at large-scale and complex government-owned facilities. Ring estimates that the Department of Defense and Energy and the National Aeronautics and Space Administration have service contracts with industry amounting to \$50 billion per year, with \$5-10 billion for GOCO (government owned, contractor operated) facility contracts. Nuclear utilities are increasingly using service contracts for technical assistance in very specific areas.²² No service companies, with broad mandates, however, have yet appeared to serve several utilities. Perhaps the closest parallel is the Yankee Atomic Electric Corporation formed in the 1950s by a consortium of 11 Northeast utilities to serve as the primary in-house technical arm for the construction and operation of several nuclear plants sited in the Northeast. The Corporation played a particularly strong role in the construction of New England's first nuclear

power plant, Yankee Rowe. Its role in the construction and operation of subsequent Yankee plants has been less prominent, however, as operating utilities have chosen to develop their own sources of expertise.

Some pros and cons of the service company initiative are given below:

Pros

- Service companies could endow numerous utilities with specialized expertise in excess in what these utilities could provide through in-house staff. Service companies could, therefore, raise the nuclear industry's level of performance.
- Service companies could play the vital role of system integrator, which has been notably absent up to this time.
- The introduction of service companies would not require institutional overhaul.
- The introduction of service companies would probably be received favorably by the public, and be perceived as an effort by the industry to bolster its dedication to safety.

Cons

- There is the potential for disagreement between a utility and its service company. The utility (and its PUC) cannot ignore the public contract to provide electricity at prices as low as possible. Should the service company take action which the utility or the PUC perceives as threatening to the fulfillment of its public contract (e.g., reactor "down-time" for intensive safety inspection), there could be conflict. There could be interminable squabbles, therefore, over who is really in charge.
- The apportionment of liability could be a problem. Would the utility be comfortable with retaining financial liability responsibilities, while handing over operational control to a service company?
- The utility would feel compelled to provide independent oversight of service company performance in light of its retention of ownership and liability responsibilities. It is questionable, however, that oversight personnel would have the capabilities to adequately assess the performance of the service company.
- Where would the staff of a service company come from? Pirating staff from the utilities and nuclear industries would reduce the capabilities of some utilities to shore up the capabilities of others.

- It remains to be seen whether a service company could attract and retain the top talent. A dynamic and growing service company might offer attractive benefits to bring talent aboard; but a stagnant market, offering service companies little opportunity for expansion, might not be as enticing.
- There still may be some anti-trust impediments to large-scale service company operations that have not been fully explored as yet.

SECTION 3: ALTERNATIVES REQUIRING MAJOR INSTITUTIONAL CHANGES

Regardless of the heightened post-TMI concern of utility executives toward ensuring safety at nuclear facilities, the adoption of changes that can be made within the current institutional structure may still be insufficient to produce adequate levels of safety and assure a long-term future for nuclear power. For this reason, it is necessary to review institutional options that go beyond the existing system. With the current hiatus in orders for nuclear power facilities, now may be the proper time to give serious consideration to the more "radical" or ambitious institutional alternatives.

The focus in this section is upon the efficacy of establishing regional nuclear power generating entities: first, utility-owned regional consortia, and second, government-owned regional power authorities. The two options are essentially based upon a single overriding premise: namely, that there are important safety and operational benefits that accrue from large-scale nuclear operations. This premise has not been scientifically proven and tends to ignore the disadvantages that accompany large-scale operations. Yet its attraction stems from the dispersion of nuclear expertise and operations so evident today. As noted previously, there are no fewer than 43 utilities or utility consortia operating nuclear power plants in the U.S. This number is likely to jump to approximately 60 by the end of the century. Nearly half of these utilities are likely to be the owners of a single nuclear facility. Looked at another way, of the existing 50 sites with nuclear reactors in operation today, a little over half are single-unit sites. How many new sites being developed will contain only single nuclear plants is difficult to say, but recent plant cancellations may produce several more single unit sites than originally intended. In short, the U.S. nuclear system is both geographically and institutionally very dispersed, particularly in relation to foreign experience and practice. Ensuring uniform operating standards and procedures across the entire nuclear/electric industry is obviously a very difficult task.

Proponents of consolidation have postulated that "uniform, high standards of safety are more assured with a small number of experienced, stable organizations than with a constantly increasing and changing set of new and inexperienced organizations."²³ This assertion, supporting both the physi-

cal and institutional containment of the nuclear enterprise, is based upon the following arguments:

1. large and concentrated operations can provide strength in depth, unlike small operations--Large and sophisticated operations need not rely upon the services of other organizations to assure safety, as in-house expertise can be drawn upon as necessary. Specialization, and the employment of a large pool of expertise can rarely be justified at small, isolated sites. Large operations can also support valuable on-site facilities such as a fire department, and machine and welding shops. All these features tend to produce an unrivaled competence and collective spirit.
2. large and concentrated operations are able to optimally advance the learning process--Through the construction and operation of several plants, large organizations are able to create an "organizational memory," eliminating the need to "reinvent the wheel" with every new facility. Problems experienced at initially constructed facilities are anticipated and eliminated at subsequent facilities.

Two generic institutional alternatives have been proposed to capture these benefits, a utility-owned regional nuclear power company, and a government-owned regional nuclear power authority. They are discussed separately in the subsequent pages.

Utility-Owned Regional Nuclear Power Company (RNPC)

There have been various proposals describing the possible creation of RNPCs in recent years. The commonalities in these approaches will be first discussed, and the idiosyncracies, later. RNPCs would be formed by a group of utilities to have complete financial, operational, licensing, and safety responsibilities pursuant to the construction and operation of nuclear power facilities. Utility ownership of RNPCs would be a further extension of the now-common practice of multi-utility ownership, single utility management, of existing nuclear power plants. RNPCs could be made up of personnel from existing (cooperating) utilities and could simply substitute for single utility management.

The RNPC approach is based upon the belief that the safe and efficient operation of nuclear power places demands upon operators that far exceed those associated with other utility activities. For this reason, it is

necessary to divorce nuclear power generation from other utility responsibilities. As presently envisioned, RNPCs would generate electricity from nuclear power facilities, and parcel the electricity to its utility owners, who in turn would carry out their normal transmission and distribution tasks. The utilities would receive shares of the electricity generated by RNPCs proportional to their degree of ownership in the facilities. Utilities would, of course, still, themselves, generate power from their non-nuclear power plants. The only change to utility operation, therefore, would be to take the generation of power from nuclear plants out of a single utility's hands.

All RNPC proposals envision concentrated siting of nuclear power plants to take advantage of the benefits ascribed to large-scale operations. They also envision siting in areas consistent with existing regional load centers and power distribution patterns. It is felt that some kind of federal guidelines or legislation would be required to ensure that nuclear generating capacity fall under RNPC jurisdiction.

Proposals for RNPCs primarily differ with respect to whether existing nuclear power plants should be incorporated within RNPC jurisdiction, or simply those plants coming on-line in the future. The IEAL model calls for only future plants to be covered, as it claims that the complexities that would be involved in the transfer of existing plants to RNPC authority are so great that a complete federal takeover would be required.²⁴ Franklin, on the other hand, feels the gradual transfer of existing nuclear plants to RNPC authority would be manageable.²⁵ He foresees the formation of 15 RNPCs evolving, with a mix of old and new reactors. Burwell and Lane propose 10 possible RNPCs, specifically matching existing reactors with the formation of RNPCs.²⁶ They also advocate an existing siting policy, whereby nuclear capacity is added to sites already containing at least one operating reactor.

Some pros and cons of this approach are provided here:

Pros

- The strength in depth and learning advantages raised earlier would apply. RNPCs would have total control over nuclear operations, and be able to exercise its authority unencumbered with other tasks (as the utilities now are). Because of the expertise and experience concentrated at multi-unit sites, RNPCs would not need to rely solely upon the judgments of nuclear vendors and architect-engineers.

- The proposed change leaves utility nonnuclear operations untouched.
- Unlike the service company option, there are clear lines of authority and liability in RNPC operations.
- With multiple-utility ownership, the financial risks and burdens are minimized. Multiple-utility ownership of nuclear facilities is already a growing trend.
- The formation of these organizations, designed explicitly to bolster safety operations, might be welcome by some segments of the public.

Cons

- The advantages derived from large-scale operations must be considered in light of possible disadvantages; e.g., overbureaucratization, with its attendant impact upon efficiencies, and innovation; and, the centralization of decision-making allowing for less local control (and perspective) over operations.
- Single-unit failure at multi-unit sites can easily lead to the shut down of all units at the site (witness the experience at TMI).
- A good deal of resistance to the formation of RNPCs can be expected from segments of the public, industry, and government. State PUC's would object, seeing this option as one to escape state control. Economic regulation of these regional bodies would probably require federal agency (FERC) control. Parts of the federal government would have anti-trust concerns. The nuclear suppliers could object seeing this as a means of supplanting their prominence. - Utility sentiments toward placing new nuclear facilities under RNPC authority would likely be mixed, while reaction to transferring existing facilities to the RNPC would probably be strongly opposed. A vocal segment of the public, attuned to the virtues of decentralization, would oppose the proposal; as would some of the population in the vicinity of the multi-unit sites.
- The relevance and importance of the RNPC option, just as the service company option, may be diminished in light of no or low growth of nuclear generating capacity.

Government-Owned Regional Nuclear Power Authority (RNPA)

This institutional option is virtually the same as the previous option, except for the provision of government, not utility, ownership.

RNPAs would have total financial, operational, and safety responsibilities pertaining to nuclear power (though they would still come under the safety regulation of the NRC). RNPAs would be self-financed and generate power from nuclear facilities and sell it to existing utilities for further distribution. Utilities would continue to have complete responsibility for the generation and transmission of power produced from nonnuclear fuels.

Just as the previous option, RNPAs would, if implemented, provide the advantages that accrue to large-scale, physically-concentrated operations. Government, as opposed to utility ownership, is proposed for the following reasons. First, because of the unique characteristics of nuclear power (e.g., high levels of radiation, the production of weapons material) government must have an inordinate interest in the safe and secure production of nuclear energy. This interest is already reflected in exclusive government operations in various fuel cycle stages. Government fuel enrichment, for example, has been relatively noncontroversial and accepted in this country. As seen earlier, substantial government involvement in the entire nuclear fuel cycle is not unusual in a number of other democratic countries. Government takeover of the generation stage, therefore, could simply be seen as another manifestation of government's legitimate concern for the safe operation of this singular technology. Second, government involvement may be necessary to provide the esprit de corps and sense of longevity crucial to dedication of service over time, but not common to private sector operations. The dedication and verve of the nuclear navy, and of the coast guard, may be appropriate precedents.²⁷ Third, top government officials may conclude that additional nuclear capacity is desirable from a national interest perspective, even if individual utilities no longer find it within their interests to add this capacity. Government ownership and financing, therefore, would be required to produce this additional capacity.

RNPAs could be established to encompass just new nuclear power facilities, or could also involve the takeover of existing facilities. The Tennessee Valley Authority (TVA) constitutes the closest analogy we have to an RNPA today, with its operation of 5 large nuclear power plants and the on-going construction of more.

Most of the pros and cons listed for the previous institutional option apply to RNPAs, as well, and will not be repeated. Pros and cons unique to the RNPA option are given below.

Pros

- If an esprit de corps and sense of longevity can indeed be instilled in an RNPA, public concerns over nuclear safety could be significantly diminished.
- Creation of RNPAs would be a decisive (concentrated, single purpose) federal action, taken in the face of energy uncertainties clouding the future. Such a step would contrast with the "muddling through" approach to energy policy that has been common to date.
- RNPAs may be a means of keeping the nuclear energy option open. The lack of new orders for nuclear power plants could lead to a dissipation of expertise within the industry. The creation of RNPAs, designed to retain a critical mass of expertise, could be viewed as a means of ensuring continuity and maintaining an ability to respond to fluctuations in energy demand and public opinion.

Cons

- There are several widespread concerns associated with government operation of nuclear power facilities: (1) the concentration of power given to a dedicated cadre of nuclear operators could lead to its abuse, both in terms of policy-making and civil liberties; (2) RNPAs could prove unresponsive to local concerns; (3) RNPAs could be more costly and inefficient than expected since they would not have to compete in the marketplace; and (4) without the fear of bankruptcy, RNPAs could lack sufficient incentives for safe operations.
- The experience of TVA does not bear out the hopes of RNPA proponents. After its early years, characterized by extraordinary dedication to achievement, TVA has settled into "middle age," and is largely indistinguishable from other large, investor-owned utilities. On the other hand, TVA has not performed in a manner that would confirm the worst fears (given above).
- Government creation of RNPAs would be widely viewed as a "bail out" for nuclear power.

- The transfer of existing nuclear facilities to RNPA authority would be enormously difficult and time-consuming.
- Public sentiment appears to be signaling a preference for less, not more, government intervention in society. The creation of RNPAs would have to take place in the face of this trend.

FOOTNOTES

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24. Institutional Options for Nuclear Power Generation, p. 137.
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APPENDIX A: PRESCRIPTIVE
REGULATION AND OVERREGULATION

The nature of nuclear regulation is seriously flawed today. This condition is a natural outgrowth of the kind of "command and control" regulation being practiced and the nature of the industry being regulated. It has much less to do with such commonly asserted factors as regulatory ignorance and self-aggrandizement, or industry mischief. The primary symptom of the problem is an antagonistic relationship between the chief regulator, the NRC, and the nuclear industry. To be sure, a healthy relationship between the regulator and the regulated should contain elements of distance and wariness. It is clear, however, that this relationship, more frequently contentious than cooperative, has deteriorated to such a degree that the primary goal of regulation--the achievement of adequate levels of safety--is in jeopardy.

A recent survey of 300 business executives, in numerous regulated industries, has shown that from a regulated industry perspective, there is a generic set of problems common to the regulator:

1. Overlap and conflict among agencies.
2. Overextension of the agency mandate--a concern with means as well as goals, leading agencies to dictate how goals will be met.
3. Overregulation without regard to costs or efficiency.
4. Adversarial attitudes toward business.
5. Delays in exercising mandated authority.
6. Duplicative and unnecessary reporting requirements.

While all of the problems just cited have been noted at one time or another in nuclear industry meetings or publications, numbers 2 and 3 have been most frequently cited by the nuclear industry as being responsible for number 4. With respect to complaint number 2, the nuclear industry claims that the NRC is usurping nuclear industry safety responsibilities by promulgating detailed plant design standards with which the industry is expected to comply. Hence, the NRC not only sets goals, but also prescribes the measures by which all facilities should reach these goals. With respect to complaint number 3, the nuclear industry claims that the absolute number of required design changes (reflected in backfitting of existing reactors and in the ratcheting of requirements for new reactors) and the pace at which they are required to be implemented, are excessive according to cost/benefit criteria. Hence, the mode or degree of regulation and the amount and pace of regulation combine to produce the adversarial relationship that exists today.

It cannot be denied that the NRC has become increasingly prescriptive. The Mitchell Report in 1965 protested the lack of regulatory guidance given utility applicants in the licensing process. Today there is no doubt concerning what is expected of applicants as it is spelled out in approximately 1500 pages of detailed criteria found in the Standard Review

Plan. Similarly, whereas in 1970 the AEC had 4 regulatory guides setting forth statutory and regulatory requirements, by 1978 the NRC had 130 guides, 110 separate revisions to the guides, and another 64 technical positions.² Areas in which the NRC has become increasingly prescriptive since the TMI accident include pipe restraint design for seismic and pipe whip requirements, security and sabotage staffing and procedures, fire protection, and operator training requirements. As can be seen, safety has increasingly become what the NRC says it is, and regulation "by the book" has become commonplace. Hence, regulation has, to a large extent, shaped industry decision-making, going well beyond the classical model of regulation whereby the regulator simply ensures that industry externalities are accounted for.

Though it is understandable that the nuclear/electric industry protests against the increasingly prescriptive regulatory role pursued by NRC, are there any reasons why the general public should be concerned as well? At least 3 reasons can be raised: First, perhaps the most deleterious effect of prescriptive regulation is that accountability, and not responsibility, becomes the industry's operating mode. Regulators and industry officials gradually come to view conformity or compliance with the rules as the measure of safety, rather than actual performance indicators.³ So much time and attention is devoted to these surrogate measures of safety ("complying with the regulations") that the larger goal of such regulation is frequently neglected. New industry-based safety initiatives are not brought forward either because the sense of responsibility has shifted or because of a fear that these initiatives will simply be added to (not subtracted from) the requirements that the NRC already imposes. Second, the shift in responsibility to the regulator can have serious safety implications because a central bureaucracy, no matter how capable, cannot adequately regulate a diverse and varied industry at the level of detail involved in NRC standards. Diverse capabilities and circumstances require a flexible approach to safety management: and a central bureaucracy, by its very nature, is not capable of the necessary flexibility. Third, this mode of regulation can have a devastating impact upon industry morale and a sense of devotion to duty. Constant oversight and punitive action in the event of noncompliance with the rules, produces an unhealthy spirit of skepticism and resistance toward all regulation. In summary, prescriptive regulation contains a number of serious liabilities that ultimately can affect public safety.

The sheer volume of new regulatory requirements emanating every year from the NRC has been as burdensome to the industry as the regulatory mode or regime. Nuclear utilities in the post-TMI environment were deluged with new requirements stemming from TMI investigations and internal NRC studies. A total of 140 discrete actions were formally approved for implementation by the NRC as part of its so-called Action Plan, a response to TMI. Other new requirements were transmitted to licensees through various channels such as regulatory guides, enforcement bulletins and circulars, information notes, NUREG documents, and other sources. Approximately 80 bulletins, circulars, or information notes requiring some kind of licensee response were sent out by the NRC in 1979 and another 80 in 1980.⁴

The utilities' reaction to the onslaught of new requirements has been captured in the document, A Survey by Senior NRC Management to Obtain Viewpoints on the Safety Impact of Regulatory Activities from Representative Utilities Operating and Constructing Nuclear Power Plants (NUREG-0839). Their central contentions were as follows: (1) that many of the required changes had not been subjected to a careful value/impact assessment, and that the burden placed upon the utilities to respond quickly in making these changes, was constantly being underestimated by NRC officials; (2) that the volume of work driven by NRC requirements was so great that the utility neither had the time nor manpower to address safety problems which it had independently identified; (3) that all the changes were adding to the complexity of the plant creating, in total, a facility less safe than before.

While the claims found in the document cited above no doubt contain a measure of exaggeration, the evidence is still disturbing. Safety is increasingly being dictated not by those closest to actual operations, but by a remote bureaucracy subject to enormous pressures. It is important that this condition be changed; yet it is also necessary to understand the factors which led to this condition in the first place. Without an understanding of these factors, it is impossible to construct an alternative regulatory process that is both feasible and desirable. The following sections identify and elaborate upon four key factors responsible for the current mode and operation of nuclear regulation in this country: (1) the nature of public opinion toward the regulation of risk, (2) the nature of the bureaucratic ethic, (3) the nature of the nuclear/electric industry, and (4) the specific nature of nuclear technology itself.

The Nature of Public Opinion Toward the Regulation of Risk

Nuclear power regulation has been subjected to the same social forces that led to the creation of new health and safety regulatory agencies in the late 1960s and early 1970s--such as the Environmental Protection Agency (EPA) and the Occupational Safety and Health Agency (OSHA). These agencies were formed because a sizable segment of the population feared that without them the health, safety, and environmental externalities associated with the conduct of business in this country would not be adequately internalized by the firm. Even as these agencies were being formed, however, suspicions arose as to how assiduously the agencies would carry out their mandates. Experience from longstanding economic regulation had shown that regulatory agencies, over a period of time, tend to reflect the interests and perspectives of the industries they regulate.⁵ The primary but not sole reason given for this development was that most of the business regulators conduct is with officials from the regulated industry and that this frequent and established interaction is very useful to industry representatives in setting forth their interests and the basis for them. The essential asymmetry between public and private access to regulators results because general public interests are usually diffuse and diluted by other concerns while the interests at stake for the regulated industry are large and immediate. Many observers feared, therefore, that the new health and safety regulatory agencies would be "captured" by the regulated industries just as some economic regulatory agencies had been "captured."

Considerable research by scholars of the regulatory process in the 1970s and 1980s fails to validate the "capture" theory: actual regulatory performance in the 1970s cannot be explained by the theory, and in many cases runs counter to it.⁶ Groups with interests at variance with those of regulated industries have been very effective in advocating their interests, gaining access to regulators, and seeing their interests incorporated within regulatory requirements. The U.S. system, with its numerous channels for group access or participation, allows for and encourages competition among the multiplicity of interests that exist.

Despite evidence to the contrary, the image of industry controlling the regulator remains strong in the public mind. A recent study states, "The public now typically thinks of government regulatory commissions as lethargic, inept, complacent, and overly eager to please industry--in a word 'captured' by the very industries they are supposed to regulate."⁷ The policies of the AEC in the 1950s and 1960s were very much influenced by industry, which was an important element in the "iron triangle." The cozy, three-way interaction was dissolved in the 1970s, however, as Congressional reforms led to the demise of the JCAE (and the scattering of its responsibilities), and public intervention in regulatory proceedings became commonplace. Weingast, in his study of nuclear power regulation, claims that increased participation in nuclear regulatory matters by non-industry groups in the 1970s, led to numerous policy compromises, and effectively eliminated the dominance of industry as an interest group.⁸ Notwithstanding this evidence, the specter of nuclear industry domination of regulatory policy remains in the public mind, and impedes the realization of a less prescriptive and less burdensome regulatory regime. It is this public concern that shapes the bureaucratic incentive structure.

Bureaucratic Incentives

Public concern over the capture of regulatory agencies contributes substantially to agency efforts to demonstrate their independence. The bureaucratic reward structure consequently is geared to producing ever more regulatory requirements and ever tightening enforcement practices. Bardach and Kagan, in their recent book, Going By the Book: The Problem of Regulatory Unreasonableness, state, "The incentives, conditions, and events that keep the ratchet wheel locked in place are deeply embedded in the structure of 'command and control' regulation.... They are not likely to be swept away by political tides or personalities that move about closer to the surface.... The political risks of erring in the direction of inappropriate leniency (an error that could lead to catastrophe) will almost always appear greater than the risks of being needlessly strict (imposing unnecessarily costly burdens on regulated enterprises)."⁹ Bardach and Kagan claim that (1) bureaucrats and agency commissioners gain enhanced reputations and prestige not for evenhandedness, but for "cracking down" or "getting tough" with the industries they regulate; (2) many regulations are a product of intermittent events or catastrophes; and (3) the fear of being challenged in court leads to unnecessarily strict and inflexible regulatory enforcement procedures.

At least partial confirmation of the Bardach and Kagan thesis can be found in nuclear power regulation. The harsh words of incoming NRC chairman Nunzio Palladino toward nuclear industry quality assurance practices brought forth editorials full of praise and support in the Washington Post and New York Times.¹⁰ Palladino's formation of an internal watchdog committee to review the appropriateness (in terms of costs versus benefits) of all major new regulatory requirements--the Generic Requirements Review Committee--received virtually no major media attention or praise. This disparity indicates quite clearly the kind of bureaucratic action that will receive public approbation.

One can also see that the TMI accident led to a spate of new regulatory requirements, just as the Bardach-Kagan thesis would predict. NRC Executive Director William Dircks went so far to say, "Many [regulatory requirements] had been backed up for years, waiting for some event so they could be disgorged."¹¹ In order to avoid yet another round of regulatory requirements (or even more severe consequences) being imposed, it is imperative that future TMIs not occur.

The growth of court involvement in nuclear regulatory affairs during the 1970s is also apparent. The responsiveness of the courts to challenges of NRC rule-making accounts in large measure for the "going by the book" approach practiced by the NRC. With the courts closely monitoring NRC procedures, policies reflecting flexibility and discrimination toward licensees are discouraged, leading unfortunately to standard or uniform policies being applied in diverse circumstances.

The Nature of the Nuclear/Electric Industry

The dispersed, fragmented, and reactive nature of the nuclear/electric industry has been a primary factor contributing to the type of nuclear regulation that exists today. Industry and utilities in other countries are far more concentrated (often nationalized) making the regulatory task simpler. A total of 60 separate utilities (or utility consortia) are now either operating and/or constructing nuclear reactors. NRC evaluations of the performance of these utilities, in recent years, has indicated that not all utilities are equally capable of or dedicated to carrying out the primary safety responsibilities that are vested with them.

The NRC, realizing that an accident or inadequate safety management anywhere reflects negatively upon not only the utility but also the technology and the NRC itself, feels compelled to be prescriptive in order to compensate for specific utility weaknesses. Since the measures needed to shore up weak utilities must often be applied in a nondiscriminatory manner--thereby penalizing first-rate utilities--it is quite understandable that an adversarial relationship exists today.

Aside from dispersed utilities with differing capabilities, the nuclear industry is beset by fragmented responsibilities so that no single organization acts as an overall integrator for safety coordination and

management. Reactor vendors supply the nuclear steam supply system; architect-engineers are responsible for the design and procurement of equipment for the balance of the plant; and the utilities are responsible for quality assurance and licensing. With each organization concentrating upon its own area of responsibility, work at the interface of these activities often suffers. Because of this institutional vacuum, the NRC feels compelled to take a more active role than would otherwise be warranted.

Finally, the nuclear/electric industry, despite an exemplary safety record to date, has been decidedly reactive rather than innovative in taking measures that would mitigate public fears.¹² While it is unfair to castigate the industry for failing to predict the rise in environmental consciousness during the late 1960s and 1970s, it was and is shortsighted of industry to expect nuclear power to be perceived as just another technology at man's disposal (given its association with military use and unique features, e.g., radiation). Seldom has the industry been out front on an issue, anticipating rather than responding to public concerns. In retrospect one can identify several key areas where the nuclear/electric industry erred: (1) the reliance placed upon engineered safeguards in lieu of remote siting; (2) reactor siting in seismic areas; (3) the relatively low priority placed upon nuclear waste sequestering; (4) the substantial ordering of large-scale reactors in the 1960s when operating and research experience had only been performed on small-scale reactors; and (5) belated attention to low probability, high consequence accident scenarios. Needless to say, the rather intransigent attitude of the nuclear/electric industry to many public fears has not made NRC's attempt to move the technology more in line with public acceptability any easier.

The Potential for a Catastrophic Accident

Though the probability of a catastrophic nuclear power accident, contaminating large areas of land and killing or injuring thousands of citizens, is extremely low, the fact that it can occur greatly influences the nature of regulation. Since there is the possibility, however remote, that when regulation fails, it will fail spectacularly, is there any wonder why nuclear regulators seek to keep the industry "on a short leash?" If regulatory failure could only mean marginal impacts upon relatively few, the amount of discretion allowed the nuclear/electric industry in their operations could be substantial. Yet it is the potentially high costs of failure that make the substitution of performance-based nuclear regulation for design-based, prescriptive regulation so problematic.

The major defect of performance-standard regulation in general is that it is not easy to measure with sufficient confidence that performance goals are being achieved.¹³ Ascertaining whether specific nuclear reactors are achieving acceptable quantitative safety goals would be difficult because of extremely low probabilities and because of the difficulties with the measuring tool most frequently cited--probabilistic risk assessment. Hence, larger degrees of uncertainty appear in performance-based regulation as opposed to prescriptive regulation; and regulators will tend to opt for paths of least uncertainty, especially when the uncertainty contains the potential for catastrophe.

Conclusion

There are serious safety problems associated with the prescriptive form of regulation practiced by the NRC. Yet powerful forces sustain and encourage this form of regulation. Were there some alteration in these forces, the chances for creation of a more flexible, performance-based regulatory scheme would improve. Can one expect, for example, a new public attitude toward the regulation of risk, in general, and toward nuclear power, in particular? The answer appears to be yes, but only to a limited extent. President Reagan has brought about (or reflected) a new, more skeptical, attitude toward the benefits of regulation, and set into motion procedures that would instill this skepticism within the bureaucracy. Rather than seriously consider alternatives to the current "command and control" type of regulation, however (e.g., deregulation or indirect regulation), the Reagan Administration has focused upon regulatory relief (i.e., reducing or slowing the number of requirements imposed upon industry). This, therefore, is a limited goal but one in which some degree of success has already been achieved.¹⁴ The formation of the Generic Requirements Review Committee within NRC closely parallels the broader administration effort to submit new regulatory initiatives to heightened scrutiny. One can expect fewer new regulations to emerge through the intensive screening process than were formerly allowed to slip through. Evidence already indicates some nuclear regulatory relief occurred in 1981 compared to the two previous years.¹⁵ Assuming no further TMI-type accidents, the nuclear industry can expect to benefit from rather broad public support for regulatory relief in general.

The chances for something more dramatic--namely, a change to performance-based regulation--would appear more favorable if there were either a positive shift in public benefit/risk perceptions of nuclear power or a dramatic change in the technology that, in effect, eliminates the possibility of a catastrophic accident. The former could occur as a result of heightened concerns over alternative forms of energy or because of success in producing the latter. Preliminary evaluations of a new reactor design touted to eliminate even the possibility of severe core-damaging accidents is now underway.¹⁶ Were such a reactor feasible, economical, and eventually deployed, it is not unreasonable to expect NRC regulation of these reactors to be less prescribed, allowing licensees more discretion in the nature of their operations.

Even though totally new forms of regulation may not be feasible at this time, it is worth thinking about how one might eventually reach such a goal. It is important that organizations closer to the actual operation of reactors than the NRC be vested with primary safety responsibilities.

FOOTNOTES TO APPENDIX A

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APPENDIX B: OVERVIEW OF THE POLITICAL/INSTITUTIONAL
ENVIRONMENT FOR NUCLEAR POWER

It may be useful to provide some perspective on the primary institutions that make up the decision-making environment for nuclear power. This will be done essentially by contrasting the pre-1970 political environment for nuclear power with the post-1970 political environment; and by providing a brief look at foreign political environments. The framework used to elucidate these political environments is given below in Exhibit B-1. It is basically a systems overview of the decision-making process used by political scientists to characterize (in the most general terms) the policy formulation and implementation process.¹ It posits that government policies, including regulatory requirements and procedures, are a product of several factors and that these policies, through a feedback loop, influence the nature of these forces or factors. In other words, there is a constant input of policy directives (from outside the political system) to policymakers within the political system who act as synthesizers, bargainers, and arbiters to produce policy outputs; these outputs, in turn, affect the nature of society, and trigger the policy-making process once more.

Environmental (exogenous) forces and conditions in society (box 1) are the basic ingredients from which political demands are created. Each society can be distinguished on the basis of conditions which exist outside the political system (e.g., economic status or wealth, cultural practices, educational levels, demographic patterns, etc.), but which largely determine or influence the political agenda. Environmental demands are most frequently aggregated and introduced into the political system by interest groups (box 2), the most familiar being political parties. In recent years, however, groups who perceive their interests as being neglected have increasingly sought to present their case directly to policymakers, independent of political parties. This has led to a proliferation of lobbying groups in Washington, D.C., and state capitals. The political demands from interest groups are then "processed" by the formal political system (box 3). A two-way flow exists between the political system and interest

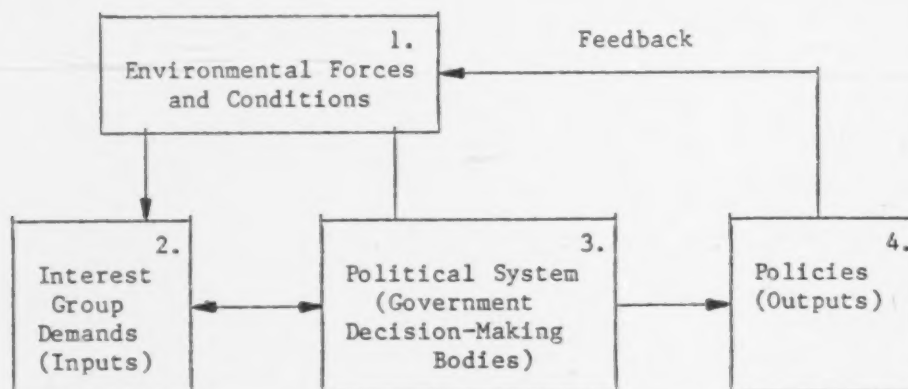


Exhibit B-1. The Political Decision-Making Process

groups brought into the fray later. Policies or "system outputs" (box 4) result from the political pull and tug that occurs within the political system.

The process just described does not, of course, fit the reality of government decision-making in all countries, not even in all democracies. It is based upon the political philosophy of pluralism whereby competing groups, representing heterogeneous interests, are encouraged to confront one another in the political arena. This philosophy, strongly held in the United States, rests on the belief that wise decisions will result if all possible sides of an issue are articulated and explored prior to reaching a decision. In order to ensure full representation of all perspectives and interests, numerous access points are embedded in the various levels and institutions of the political system, maximizing public participation. As a consequence, the process of making political decisions becomes extremely formalized, cumbersome, and complex, and bargaining among interest groups and politicians ensues. The pursuit of pluralism in this country, combined with the constitutionally mandated division of powers, produces a decision-making process better known for its safeguards than its efficiency or authoritativeness. The system, therefore, can be a source of considerable frustration in the absence of societal consensus on important issues.²

Pre-1970 Environment

Exhibit B-2 portrays the primary forces and organizations that together constituted the political environment for nuclear power in the pre-1970 period. In terms of the environment outside of the political system, the key elements were high electricity demand growth rates and a public generally supportive of nuclear power to fulfill the demand. During the 1960s electricity growth hovered around 7 percent per year, creating a powerful incentive for utilities to order and deploy large-scale, base load nuclear generating units. After initial utility concern over the costs and novelty of nuclear power were largely dissipated, many utilities were eager to add reactors to their grid. In terms of interest groups, the nuclear industry (including the utilities) was clearly the dominant group influencing the government at this time. Broad antinuclear sentiment, though not nonexistent, was primarily the occasional "not-in-my-backyard" variety--witness the fact that construction permits were generally uncontested, with hearings being held for no more than two days. In 1967 the nuclear-electric industry consisted essentially of 7 nuclear steam supply vendors, 10 architect engineers, and 18 utilities (operating 18 reactors with a total of 3000 MWe of generating capacity).

Nuclear policies in the 1960s were primarily the result of the interaction of three groups, the nuclear/electric industry, the Atomic Energy Commission (AEC)--including the Advisory Committee on Reactor Safeguards (ACRS)--and the congressional Joint Committee on Atomic Energy (JCAE). In this sense, nuclear power was typical of other highly technical and specialized issue areas where policies were essentially the province of the regulators, the regulated industry, and the congressional committees or subcommittees responsible for oversight. These "iron triangle" coalitions

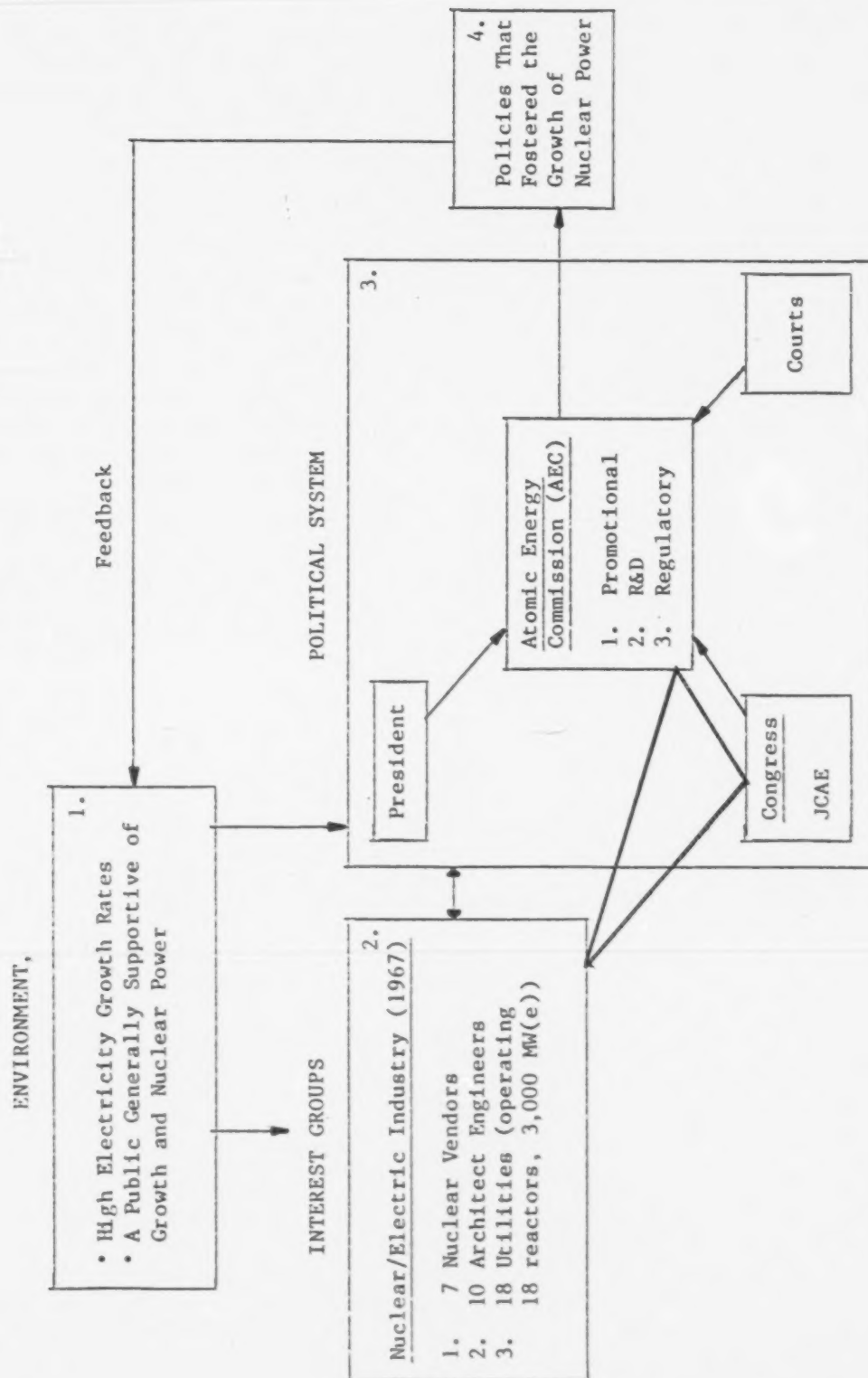


Exhibit B-3. Pre-1970 Political Environment

were formed due to the intense interests and specialized knowledge of the groups cited, and the diffuse interest and expertise of the general public. It now appears that the "iron triangle" metaphor, though accurately descriptive of the primary groups involved, was overdrawn by political scientists in the misleading sense of its indestructibility.

The President, or the executive branch in general, had relatively little impact upon nuclear regulatory policies in the 1960s because of the independence of the AEC. The AEC (and later the NRC) was established by Congress as an "independent" regulatory agency, as opposed to a regulatory agency falling under the jurisdiction of the executive branch. Independent regulatory agencies are often termed "arms of Congress," denoting the primary policy influence upon the agencies. The President is empowered to appoint commissioners to the agencies but this power is tempered by (1) the necessity of Senate confirmation, (2) the inability of the President to remove appointed Commissioners from their positions, except in very unusual circumstances, and (3) the staggered and relatively long terms served by commissioners (thereby preventing "packing" of the commissions). The limits of Presidential power over the 18 independent regulatory agencies that exist today were carefully and purposefully prescribed by Congress to minimize partisan control.

Courts are still another factor within the political system. They can strike down agency rules and regulations on the finding that they are (1) arbitrary and/or capricious, (2) contrary to constitutional rights, privileges, or immunity, or (3) in excess of agency statutory jurisdiction. During the 1960s the courts were relatively silent since there were few challenges of AEC rules and regulations brought before them.

The policies emanating from this political environment (box 4), not surprisingly, were ones that fostered the growth of the nuclear industry and led to ambitious plans for the construction of nuclear power plants. It should be remembered that the AEC's mandate was both regulatory and promotional. Many observers, several even within the nuclear industry itself, now claim that the success achieved in the early years of commercialization was a mixed blessing. Numerous 800 to 1000 megawatt nuclear reactors were ordered by utilities in the 1960s when operating experience on nothing larger than 200 MW(e) reactors was available. The increase in scale produced unforeseen problems. Hence, policies that led to the commercial success of nuclear power in the 1960s produced unanticipated consequences, which, through the feedback loop in the political environment, helped alter the environmental forces and conditions facing nuclear power in the 1970s.

Post-1970 Environment

Exhibit B-3 provides, in capsule form, the forces and institutions that make up the political environment for nuclear power after 1970. The differences from the pre-1970 environment are striking and deserve elaboration.

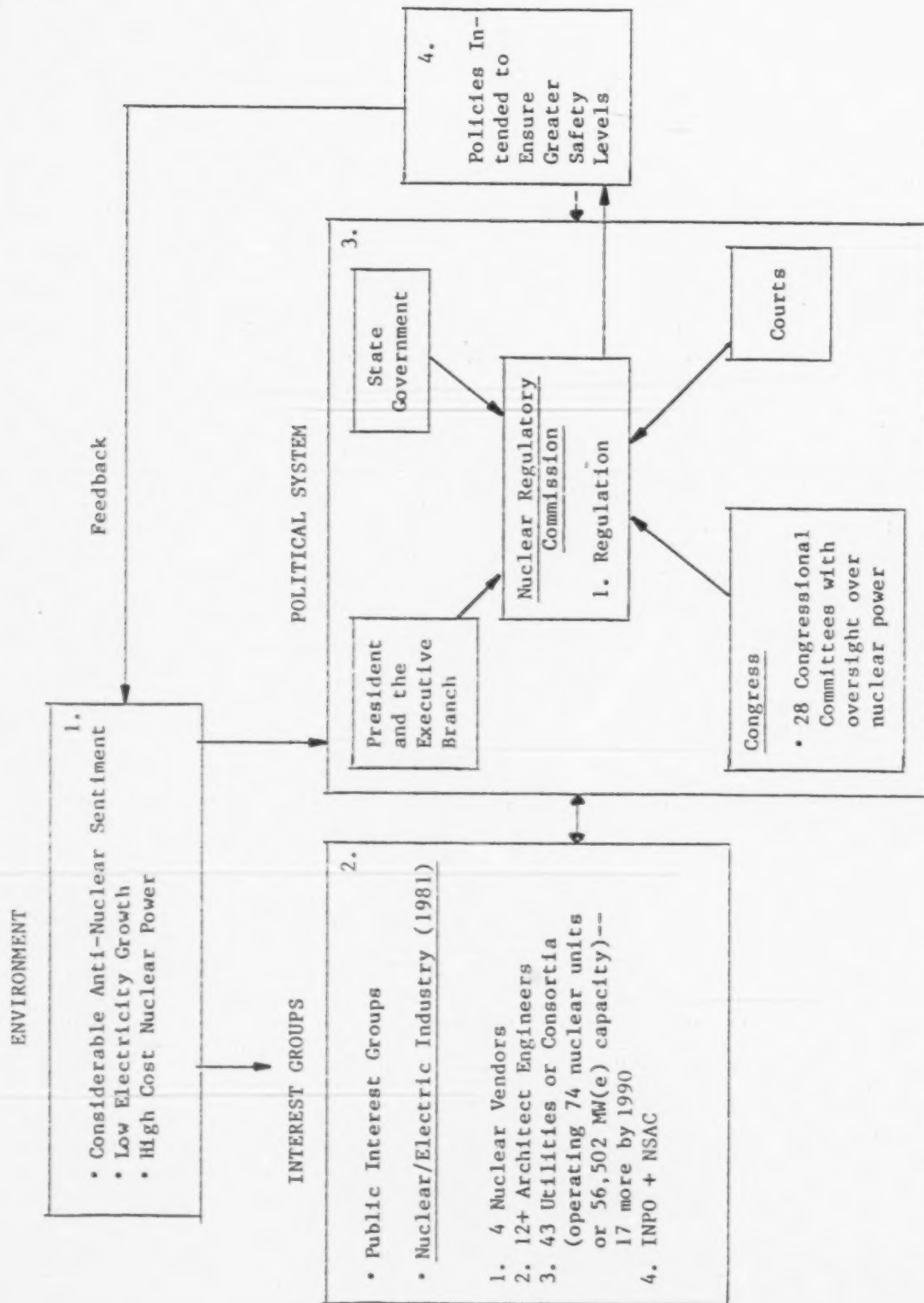


Exhibit B-3. Post-1970 Political Environment

The most fundamental change has occurred in the environmental forces and conditions category (box 1) where electricity demand is down considerably and public antinuclear sentiment is up. With the benefits of nuclear power tempered by a demand-constrained environment, the perceived risks associated with nuclear power loom large in the public mind. Though public opinion polls rarely indicate an absolute majority of the populace holding antinuclear sentiments, they consistently indicate serious reservations held by at least a third of the population.³

The question of why large-scale opposition to nuclear power exists has been a subject of considerable interest and speculation. Recent social science research appears to provide considerable, even if not definitive, insight into the question. From surveys of public risk perception, Slovic et. al. find that public fears of nuclear power are intense, and based upon several considerations. They claim that most important is the catastrophic potential of nuclear power; hence even when small and insignificant incidents at nuclear power plants occur, they are frequently viewed as precursors to extremely serious accidents.⁴ Inglehart approaches public fears from another perspective. He suggests, on the basis of several cross-national surveys, that western society has undergone a significant value transformation in the 1970s. Specifically, he points to the increasing number of "post-materialists" in Europe and the U.S. who value preserving the environment, improving the quality of life, and self-expression over the "materialistic" values of material consumption, physical security, and order.⁵ Inglehart singles out nuclear power, claiming "nuclear power has come to symbolize everything the 'post-materialists' oppose."⁶

The interest groups concerned with nuclear energy (box 2) have also changed since 1970. Opposition to nuclear power has been aggregated by so-called public interest groups that function as a counterforce to the interests of the nuclear/electric industry. The best known of these groups are the Union of Concerned Scientists and the National Resources Defense Council. Input to policymakers, therefore, no longer comes solely from the industry, but also from opposing groups as well. As a result, the iron triangle of the 1960s no longer prevails.⁷ The nuclear/electric industry has grown considerably during the 1970s. By 1981, 43 utilities or utility consortia were the owners and licensees of 74 nuclear reactors. It is predicted that 17 other utilities will be in the nuclear business by the end of the decade. New industry-supported institutions have appeared on the horizon in the wake of the Three Mile Island accident. Specifically, the Institute for Nuclear Power Operations (INPO) and the Nuclear Safety Analysis Center (NSAC) have been formed to facilitate the transfer of information and expertise among the industry and utilities.

The political system for nuclear power decision-making (box 3) has changed quite radically since the 1960s. First the AEC has been replaced by the NRC as the primary nuclear regulatory body. This was more than a change in name alone as Congress stripped the NRC of all promotional responsibilities previously held by the AEC. Second, the congressional situation changed drastically when the Joint Committee on Atomic Energy was abolished in 1977. In its place, two committees were given primary NRC

oversight responsibilities, the Senate Environment and Public Works Committee and the House Interior and Insular Affairs Committee. In fact, however, nuclear power has become fair game for an abundance of committees or subcommittees, with no fewer than 28 claiming some sort of jurisdiction over nuclear power.⁸ With the sentiments held by committee or subcommittee chairmen ranging from rabidly antinuclear to staunchly pronuclear, Congress has become a primary arena for interest-group battles. The NRC cannot, obviously, be equally responsive to all congressional directives; nor can it proceed on its own course, oblivious to the strongly held views of individual congressmen. Perhaps the best the NRC can do is skillfully steer a course that avoids the "land mines" in their congressional relations. Third, the courts have become far more active in nuclear regulatory affairs than they were in the 1960s. This is, in large part, because of court challenges brought by individuals or groups to NRC rules and procedures. The 1981 Annual Report of the NRC lists a total of 43 court cases now under review.⁹ In some of the cases already concluded, the courts have ruled against the NRC. In short, the courts have often become responsive political tools for those individuals and groups seeking redress for political decisions made elsewhere.

Finally, the activism of state governments--a force not felt in the pre-1970 period--must now be recognized. States were essentially left out of the regulatory process (except for traditional public service commission powers vis-a-vis utilities) in the Atomic Energy Act of 1954, and it is still well established that responsibility for radiological health and safety rests with the federal government. Nevertheless, states have used their traditional powers over land use as a pretext for involvement in nuclear power decision-making. Approximately half of the states now claim some authority over the siting of nuclear power reactors, and at least 10 states have adopted moratoria on reactor construction.¹⁰ It is possible that the courts will strike down state restrictions placed upon nuclear power activities, but such a development could eventually lead to proposals to amend the Atomic Energy Act.

There is at least as much support in the White House today for nuclear power as there was before 1970, providing virtually the only constant in the pre- and post-1970 political system equation. The Department of Energy (DOE) has inherited the AEC's multi-million dollar research and development program. The DOE also formulates nuclear policy initiatives to submit for Congressional consideration (such as in the licensing reform area). The Environmental Protection Agency is still another executive branch agency that impacts NRC rulemaking.

It should be recognized that the changes in the political system just described, which impact policymaking directly are, in part, a result of forces larger than the nuclear power issue. This dispersion of congressional authority over nuclear power, for example, occurred as a result of a congressional reform movement in the 1970s to cure the abuses evolving from seniority control over key congressional committees.¹¹ Similarly, judges in the 1970s displayed an increasing willingness to intervene in regulatory affairs (on substantive grounds as well as procedural) to ensure that the

interests of all groups affected by a decision are equitably accounted for.¹² Yet another broad political current that could affect policy outcomes is state-level activism.

Given the changes in the political environment for nuclear power that have occurred, it is not surprising that regulatory policies (box 4) are far less favorable now to increasing nuclear power development than in previous years. Policies designed to ensure greater safety levels increase the costs of nuclear power, making it a less viable option in the eyes of utility executives.

Comparison with Foreign Political Environments

Important features of the U.S. political environment can be highlighted further by briefly comparing it with the political environments of France and the Federal Republic of Germany. Government policies differ substantially despite significant public opposition to nuclear power in every North American and Western European country. These differences exist to some extent because of varying risk/benefit perceptions. The lack of large-scale indigenous resources and heavy dependence upon OPEC oil place nuclear power in a far different light in France than in the U.S. More fundamentally, however, political systems differ, affecting policy outcomes.

The pluralistic, interest-group based model of political interaction, described earlier, does not fit France. In France, the primary direction of policy development is from the government elite to the masses, as the government is perceived of as the guardian of the general will, above the squabbling of parochial interest groups. This is especially true with respect to high technology where specialized expertise is a prerequisite to participate in policy discussions. Virtually the only way that the general populace can influence nuclear policy, within the existing system is through the election of members to Parliament, who collectively can establish the overall national direction (all the major French political parties now support nuclear power).

French nuclear regulatory policy is the result of deliberations between the French Atomic Energy Commission (CEA), which still possesses promotional as well as regulatory responsibilities; the single national electric utility (EdF); and Framatome, the single nuclear vendor. In addition to having only one utility and one vendor, the French employ one basic standardized PWR that is replicated at clustered sites. This consolidation of the industry significantly facilitates efficient regulation and rapid deployment of facilities.

The French courts have not been sympathetic toward intervenor challenges, since the courts are viewed as defenders of the state or nation, rather than protectors of individual rights.¹³ Challenges to regulatory policies are viewed by the court as special-interest pleading. Even local governments are essentially bureaucratic arms of the central government rather than independent levels of government.

possible in the U.S. where opportunities for intervention in the political (and narrowly regulatory) process abound. How the pre-1970 consensus on nuclear power can be resurrected is difficult to foresee and subject to considerable interpretation and speculation.

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EFFECTS ON THE NUCLEAR INDUSTRY OF NO NEW-PLANT ORDERS, 1985 to 2000

By William J. Lanouette

This report gives a candid description of conditions in the nuclear industry today, and of expectations for the future, with emphasis on productive capacity and personnel requirements. It is based on an analysis of available data, and on interviews with representative industry members from our main sectors -- utilities, reactor vendors, architect-engineers, and suppliers. The views of industry analysts, consultants, and trade-association representatives are also included. The report seeks to describe which of the four main industry sectors are likely to suffer (or benefit) from an absence of new-plant orders through the end of this decade, and the end of this century.

1. Overview of the Nuclear Industry

Q: How's business this year?

A: Oh, average.

Q: What do you mean by average?

A: You know -- worse than last year, better than next.

The "nuclear industry" is an entity in search of itself. It has always been a loose-knit group, at first centered around federal activities to develop both military and civilian projects, later focused on the electric utilities with nuclear ambitions. Today the industry's chief sectors are the utility companies with nuclear power plants, reactor manufacturers (vendors), architect-engineering firms with a specialty in nuclear design and construction, and the suppliers of both equipment and services.

In the beginning (1940 to 1954) the Federal government dominated the nuclear industry, defining its standards and directing its growth. But with the "Atoms for Peace" proposal by President Dwight D. Eisenhower in 1953, and the passage of the Atomic Energy Act of 1954, the electric utilities gradually began to replace the Federal government as the nuclear industry's heart.

Indeed, it has been federal policy since the mid-Fifties to foster a competitive nuclear industry, and over the years federal contracts were often led with this goal in mind -- consciously spreading research and development work to several companies in order to stimulate competition. And by 1971, Atomic Energy Commission (AEC) Chairman, James R. Schlesinger, warned the industry in a landmark speech that it should no longer look to the government for survival. "It is not the responsibility of the Atomic Energy Commission to solve industry's problems which may crop up in the course of commercial exploitation," he said. "That is industry's responsibility, to be settled among industry, Congress, and the public."

For a time the industry's independence seemed possible, as new-plant orders multiplied: there were 21 in 1971, 38 in 1972, 41 in 1973, and 26 in 1974.¹ At the time, the drop in orders during 1974 was explained by an industry analyst as the result of "the sudden, though probably temporary, flattening out of the historical seven percent annual growth in electrical consumption..."² In retrospect, 1974 marked the end of the "good old days" for nuclear power.

Perhaps most significantly, 1974 was the last year of the AEC's existence. Thereafter the agency's regulatory functions were transferred to the new Nuclear Regulatory Commission (NRC). The AEC's research and promotion

functions went to the new Energy Research and Development Administration (ERDA), which was a much less aggressive patron of the atom. And, by 1977, ERDA's functions were incorporated in the Department of Energy, whose first secretary, James R. Schlesinger, led many in the nuclear industry to believe that they had finally been abandoned by the government that gave this their start.

Too, 1974 was the last year of life for the Congressional Joint Committee on Atomic Energy, a protective and promotional body that, over the years, had dictated nuclear policies to both Congress and the AEC. With the joint committee's demise, jurisdiction for atomic energy devolved to more than a dozen House and Senate committees and subcommittees: some still avidly pro-nuclear, others just as strongly anti-nuclear, and many rather indifferent to the fate of this energy source.

As it turned out, 1974 was significant in another way as well. No domestic order for a nuclear plant has been placed since 1978, and no order placed since 1974 is still active. Last year, for example, 28 nuclear plants then under construction were delayed by utilities, and 18 were cancelled outright.³

With the federal monopsony passing, and the nuclear industry's focus shifting to the electric utilities, cohesiveness came from two quite different sources: the professional acquaintance with a technology that was mysterious to most laymen, and the camaraderie based on both professional pride and defensiveness toward anti-nuclear critics. The nuclear industry may be portrayed as a monolith by its critics. In fact, it is a very fragmented entity, and always has been -- with increasing specialization only making

matters worse. This basic fragmentation is worth remembering as we assess the nuclear industry's present and future prospects, for it may help to explain the ease with which some companies and individuals can abandon the enterprise. On the other hand, it is also worth remembering that faith in the promise of nuclear technology, and loyalty to its development, are equally compelling forces. This faith and loyalty may explain the tenacity with which companies and individuals can remain committed to the enterprise despite its financial failures.

Nuclear energy has been considered the "technology of the future" for decades, and this forward-looking perspective is another important feature of the industry. With this viewpoint it has often been considered easier for government and industry decisionmakers to focus on the future rather than to deal with the problems of the present. And this orientation continues today, although with diminishing force. Now faced with a hiatus in new-plant orders that began in 1978 and could last a decade or more, the U.S. nuclear industry is adjusting to declining business and rising competition both at home and abroad. To be sure, some sectors of the industry are thriving, although increasingly at the expense of other sectors. "Competition is getting vicious," one industry veteran said. Many industry members are upset, too, with the swiftness of the business decline. "Everybody didn't want to admit it to themselves until about a year ago," one supply company director said. "We didn't [admit it] until a few weeks ago." What he finally had to admit, he said, is that domestic new-plant orders may not resume for a decade or more -- if at all.

It may seem curious that an industry so firmly focused on the future did not see its present problems long ago. In large part, however, today's problems are the result of several changes that occurred quickly. "We in the nuclear power industry often talk as if we are the chosen instrument of God," one veteran of more than thirty years in the business said. "We supposed we were immune to all laws of politics and economics. Well, we found out pretty quickly that it just ain't so." In fact, this veteran said, "our industry had a great surge of success to live on -- true success that allowed us to make a productive contribution to the economy. None of us should have been surprised, then, that a hiatus in the national economy's growth, the world energy crisis of the last 10 years, the increased efficiency of energy use, and the changing role of energy in the economy, would all affect the way we do business. By coming into the commercial marketplace, nuclear power made itself a natural victim of those economic forces that bear on us today."

2. The Focus on New-Plant Orders

To the extent that there is a focal point for the nuclear industry today, it is the utilities: they alone must decide whether or not to build and operate nuclear power plants, and to contract for services to operate and repair them. The utilities' decisions to buy plants set in motion complex legal, financial, technical, and institutional reactions. As a result, the nuclear industry as a whole finds itself in the uneasy position of waiting for the next new-plant order to occur -- at the same time hoping that the next cancellation won't occur.

Optimists in the nuclear industry predict the next order may come as early as "mid-decade"; pessimists predict its time may be "never."

Significantly, optimism remains a distinguishing feature of the nuclear industry. Some industry analysts believe that new orders will return in numbers, not just one at a time, when a large utility, or a consortium of utilities, buys several identical plants at once -- beginning the long-anticipated era of nuclear-plant standardization.

But amid this continued optimism there is also some new, atypical pessimism about new-plant orders, and thus about the whole future of the nuclear enterprise. Vendors, architect-engineers, and suppliers all look to the utilities for the first signs of a nuclear revival in this country. But when asked when the first new order might be placed, a common reply is both bold and blunt:

"No utility executive in his right mind would order a nuclear plant today, given all the uncertainties."

From this perspective, the question of when the next new order might occur really depends on when -- if ever -- those many uncertainties about nuclear power generation are likely to be resolved. Among the uncertainties that industry members mentioned repeatedly are: electricity demand forecasts, the federal and state regulatory climate, public and political support -- or opposition -- to nuclear technology, costs and timetables for new-plant construction, and the probability that new safety features may be added to planned and operating plants at any time.

3. The Consequences of No New-Plant Orders

There is already evidence that the suppliers of several types of nuclear equipment are leaving the business -- perhaps forever. One clear sign is the

decision by suppliers not to renew the "N-stamp," a certificate issued by the American Society of Mechanical Engineers (ASME) for the manufacturer of nuclear plant components. N-stamps are not specifically required by the NRC for the manufacture of safety-related nuclear-plant components; however, they are required by some states, and their use certifies that certain NRC quality-assurance requirements have been met.

The number of domestic firms holding N-stamps dropped about 15 to 20 percent since 1979, the year of the celebrated accident at Three Mile Island, and an ASME official said that the drop would probably be greater if the renewal were annual instead of triennial. By contrast, foreign N-stamp registration has held steady. By the end of 1982 some 400 companies in the United States and Canada held about 900 N-stamps, according to the ASME. An additional 50 companies held about 100 certificates for "Q-system" accreditation on nuclear-grade materials. Overseas, about 70 companies held about 100 N-stamps, and about 20 companies held about 50 Q-system certificates.

Maintaining an N-stamp requires both personnel and money. Thus, in the absence of new nuclear business, several smaller-sized companies have decided that they cannot justify the costs. In addition to the \$5,000 to \$10,000 that must be spent for ASME certification (renewable at the same cost every three years) there is also the need to dedicate part of the plant and at least one or two employees to the intricate paperwork that accompanies each N-stamp component. With all this in mind, cost estimates for maintaining a stamp range from \$25,000 to \$150,000 a year. Suppliers say that no other work,

including contracts for the National Aeronautics and Space Administration and the Navy nuclear program, requires such a detailed paper trail.

On the other hand, the N-stamp imparts a certain status to a nuclear supplier's operations, and those who must consider letting their certification expire say they would do so reluctantly. "It's a nice marketing tool," one supplier said, "even when you're selling non-nuclear items. And it's good discipline for a company to have it." Some suppliers and utilities report that they must persuade their sub-contractors to keep the stamp. "We're giving companies [with N-stamps] our non-nuclear business, just to help them along," one utility executive said.

There is frequent speculation within the nuclear industry that if no new-plant orders occur by the end of this decade, one or two reactor vendors may be forced to quit the business; a few analysts say this could occur within a year or two. Offsetting this is recent evidence that service contracts and fuel supplies could sustain some of the vendors for years. So far, the vendors' only immediate hope for a resurgence of orders is from overseas. But aggressive sales and financing efforts by France, West Germany, and Japan make U.S. prospects abroad nearly as bleak as they are at home.

Vendors, architect-engineers, and some suppliers are already entering the market once dominated by specialized consulting firms: the so-called "alphabet soup companies" with innocuous letters for names, that manage technical and regulatory work for the utilities. As a result of this competition, some consulting firms have been forced to merge or leave the business, often forsaking energy work for defense contracts.

The absence of new nuclear business has already led many firms to cancel, or curtail, their research and development (R&D) work. This has given potential foreign customers the impression that U.S. nuclear technology is becoming obsolete. As a Finnish source told Nucleonics Week: "'Why should Westinghouse put in millions (of dollars) for R&D if they don't have business prospects.' That is one reason why 'we are not studying their (U.S.) reactors in [a plant-purchase] feasibility study.'"5

As suppliers leave the nuclear business, those remaining may be able to dictate prices with less regard for market competition. One utility reports that 40 percent to 50 percent of the money it spent last year on contracts went to single-source suppliers. A more typical range for such single-source procurement is about 24 percent to 30 percent, a company executive estimated. But this is an increase from about 15 percent to 20 percent a decade ago.

Another utility executive complained that this firm is "gouged" by its component suppliers "quite often," and sees the practice only becoming more frequent in the future. Competition is also constricting for some services. In one city, the number of heating-cooling-air conditioning firms qualified to work on nuclear plants has dropped from seven to three to the past three years. And among those remaining, only one is considered competent by the local utility.

Despite efforts to streamline nuclear-plant licensing, constructing schedules may actually take more time in the future -- not less -- if vendors and architect-engineers rely on a dwindling number of domestic suppliers for components. With less nuclear work to do, U.S. suppliers say that they are

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likely to arrange their production schedules in order to use qualified craftsmen and their special machinery only when a number of orders are in hand -- postponing work on some projects for months. Or, they will require "premiums" to meet deadlines that are more convenient for the utilities.

One utility executive estimates that components requiring an N-stamp can cost 20 percent to 200 percent more than identical items without such certification. And overtime premiums must be paid on top of that mark-up. "He'd get the part for you, when you wanted it," one utility executive said of a supplier, "but you'd have to pay for a whole shift to go on overtime." A "normal" delivery time for some common N-stamp valves is 12 to 14 months today. By the end of this decade, without new-plant orders, this could double through a lack of domestic competition, some industry members predict.

However, there is growing evidence that foreign suppliers are willing and able to compete for U.S. component orders, and this may alleviate delay problems caused by limited domestic manufacturing capacity.

Declining business has also caused confusion in the bidding process for many segments of the nuclear industry, as more and more firms scramble to diversify in the face of falling profits. "Anything in an RFP [request for proposal] that's at all related to our business, we'll bid on it," one nuclear consultant said. "We've got to try for anything out there, just to survive." Such competitive pressure has already had the effect of muddling the contracting process for some utilities, at times compounding the paperwork needed to arrange for parts and services. On the other hand, competition seems responsible for a recent drop in the price of certain contracts

services; especially those related to the finishing-construction and the start-up of new nuclear plants.

A U.S. nuclear industry that must survive more than two decades without new-plant orders (e.g., 1978 to 2000) can be expected to have only one or two vendors, a like number of architect-engineers, and no more than a few hundred component suppliers -- all increasingly dominated by foreign competitors. Service contracts will still be available from the utilities with operating nuclear plants, but the principal business will evolve to the redesign of some plants to extend their operating lives, decommissioning, and spent-fuel disposal. (A commercial reprocessing industry would probably not exist under such conditions, although, by federal policy changes it may come to pass that utilities will be turning over their spent fuel to the Energy Department for use in the weapons program.) The domestic uranium mining and milling industry could expect sustained business only from foreign clients.

The most confusing aspect of this possible situation is that the utilities with operating nuclear plants would be forced to rely increasingly on foreign suppliers for replacement parts -- or pay for custom-made parts from the remaining domestic manufacturers. As a result, they might have to adopt foreign designs, and to modify their plants accordingly.

The nuclear industry that survives until the turn of the century without new-plant orders would also be more highly centralized than it is today. Utilities and/or vendors would be likely to have well developed inventory-sharing schemes, of the sort recently begun by General Electric Co. "I see them as a form of disaster insurance," a utility executive said. "One utility can't afford to stock a spare reactor coolant pump, for example, or some other

large, long-lead-time item. But ten utilities can afford to share the cost. Then, if one plant needs [the equipment] the operation won't be shut down for two years."

Utility and architect-engineering executives warn that a sustained hiatus of new-plant orders could adversely affect operating plants by reducing the skills and facilities available to analyze and correct problems that develop. "Safety may be compromised in the name of efficiency," one architect-engineer said. "Your primary objective will be to keep the plant on line, as long as possible. When it breaks down, repairs may be so expensive that your only choice will be to scrap it."

One architect-engineer said that utilities may treat their nuclear plants as "cash cows," to be used as long as possible, then promptly retired. This view was disputed by utility and regulatory sources, however, on the assumption that a plant would be shut down for failure to meet safety criteria before its operation faltered.

4. The Consequences of Delayed New-Plant Orders

If nuclear plants are built in the United States, after 1990 or after 2000, parts of the industry needed to complete the task would need to be assembled anew. Design teams -- for vendors, architect-engineers, and suppliers -- could be greatly diminished, if not actually disbanded, by the end of this decade. Field-construction teams for contractors would lack the first-hand experience, and experienced supervision, required by nuclear-plant work. And technical specifications would be obsolete for some components, or at least in need of extensive revision. "It would probably be easier to start

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from scratch" when assembling a construction team, one architect-engineering executive said.

Firms wishing to bid on new-plant components would have to spend a minimum of two years qualifying for N-stamp certification. Federal and state inspection teams would have to be assembled and trained. Utilities would have to expect that some of their contractors may be incompetent. "You'd be giving them on-the-job training, at your expense," one utility executive said.

But perhaps more significant, the competition that did survive the hiatus would likely be based on expectations and promises as well as on operating experience -- a return to the frustrations of the Sixties, when new-plant costs and timetables expanded dramatically. Said one senior executive with a vendor: "New plant orders would put this industry right back where it was in the Fifties and Sixties, when we looked at these large projects and asked, 'What will they cost? When will they be built? When will they operate?' We'll face the problems of a new industry all over again, with lots of first-of-a-kind hurdles."

A significant exception, mentioned by several industry sources, is the fuel services business. This would not have to be reconstituted: it would exist in a rather healthy form, based on continuing work for both domestic and foreign clients.

One way around the first-of-a-kind problems would be for U.S. utilities to order plants from abroad -- a prospect that many in the industry consider possible. But this, too, would create other first-of-a-kind problems, especially with the licensing of new design and components. Too, utilities

would face administrative and regulatory confusion when they tried to blend foreign technology with that made by domestic designs.

Besides, political pressures to "buy American" would probably limit the flexibility that utilities had to choose from among available suppliers and contractors. The only way around this would be for the Federal government to finance research and development projects, as it did in the Fifties and Sixties, in order to foster a competitive industry. This, however, would add years to the schedules for completed plants. Federal assistance with research and development would probably need to extend to design and construction as well, at least in a limited way. "I'm not sure utilities, on their own, would be able to order the next new plants," one senior nuclear-industry executive said. "Some new institutional arrangement, or some [federal] demonstration program may be necessary before utilities could come back into the market and buy them."

The first plants built after the hiatus would also be more expensive than foreign alternatives, and probably more demanding to operate. Predictability for costs and operations would only come after several new plants of the same design were built and run.

5. Activities Likely to Continue, and to Cease

Unless the regulatory requirements for nuclear-plant operation are greatly simplified, there will always be work for firms specializing in such matters. In fact, more red tape is expected in the years ahead from state agencies, and from industry self-regulation by organizations like the Institute for Nuclear Power Operation (INPO). "We're inundated with inspectors," one utility executive complained. "Besides the NRC there's INPO; the insurance pools; the state agencies, for everything from boiler codes to air and water quality; and the emergency planners, from FEMA [the Federal Emergency Management Agency] in Washington right down to our local sheriff." Much of the paperwork to meet his array of regulations may be handled by specialized contractors in the future.

Fuel fabrication and handling, and spent-fuel management, will also be required for operating plants, whether or not new plants are built. To many suppliers and contractors today, in fact, the "back end of the fuel cycle" remains an attractive and potentially lucrative sector of the nuclear industry -- albeit one that is becoming increasingly competitive.

Personnel services -- both recruiting and training -- will be needed, as the industry becomes increasingly labor intensive. One utility executive estimated that he needs one-third to one-half as many more employees to operate a plant recently licensed as one that began operations ten years ago. In addition, the use of temporary workers for high-radiation areas will require more sophisticated recruiting and monitoring services as the nuclear industry matures.

Health physicists will continue to be in short supply, as will specialists in employee health benefits and claims, according to utility executives. Legal services, already a conspicuous feature of nuclear-plant operating budgets, are likely to expand to meet changes in the laws that determine health effects for workers.

Public relations and political activities (including lobbying at the federal and state levels) are also likely to increase, a utility executive predicts. "You'll have to fight for everything you do, at the state house or at city hall," he said.

At the moment it is easier for industry to see which work will remain than to predict which work might diminish or disappear. However, certain segments of the industry seem endangered.

With an absence of new-plant orders, manufacturers of specialized equipment -- such as pressure vessels or in-core instrumentation -- are likely to shut down their operations; indeed, plant closings have already occurred and more are anticipated.

Environmental specialists will become extraneous if no new sites are needed for nuclear plants. Their skills may be used to make decisions about plant decommissioning, and to cope with future operating accidents. But if new orders are placed, they will likely be for sites already selected and approved by state and federal authorities.

Companies that have grown to meet specialized needs -- such as licensing hearings, financing arrangements, and export procedures -- can also be expected to decrease, and perhaps cease, their operations.

6. Personnel Requirements

With no new domestic plant orders by the end of this decade, the nuclear industry may be perceived as "dead" or "dying" by the young people needed to keep it alive -- recruits from technical schools, colleges and universities, and the Navy nuclear program. New recruits are needed even if nuclear power does not expand much beyond its present size, just to replace skilled workers who are due to retire. Thus, even in the absence of new-plant orders, serious personnel shortages could occur for certain nuclear-industry workers.

An Energy Department survey done in 1981 identified 249,533 workers in the nuclear field (about 37 percent in federal employment, 63 percent in the private sector), and another 19,072 in nuclear-related activities.⁶ (Interestingly, the two principal activities, weapons development and production and reactor operation and maintenance, involve about the same number of employees: 42,239 in the former, 41,649 in the latter. The next largest category, the design and engineering of nuclear facilities, involves 25,535 employees.)

Today there is a shortage of qualified field engineers, health physicists, systems analysts, reactor operators and supervisors, and certain mechanical analysts -- such as pipe-stress specialists, electrical engineers, and corrosion experts. A personnel study by the Institute of Nuclear Power Operations⁷ concluded that by last spring the industry's overall vacancy rate for nuclear-related positions had reached 12.5 percent. The rate was more than 20 percent for reactor and radiation-protection engineers and for health physicists, and more than 25 percent for qualified training personnel.⁸

Skills in surplus today include nuclear-design engineers, environmental specialists, and science graduates with general degrees in nuclear physics. Declining nuclear work has already prompted layoffs by many kinds of firms. The first to go are designers and draftsmen, quality-assurance personnel, certified skilled craftsmen, general secretarial and support staff, and construction supervisors. Predictably, these would also be the persons first hired if a revival in new-plant orders were to occur. Environmental engineers -- many of whom have already been laid off or retired -- would also be needed for site-selection and preparation work, although not in the numbers seen during past construction.

An Oak Ridge Associated Universities study in 1982 projected that total employment in the civilian nuclear industry could reach 73,600 by 1991, but that in order to meet estimated growth and replacement needs an additional 55,600 employees would have to be recruited.¹⁰ Of these recruits, the study noted, about 75 percent will require specialized training and skills, and about 17 percent will need to be in professions requiring management, engineering, and scientific training. Significantly, the engineers pose a problem worth noting. As the study concludes: "The projected need for 6,000 additional engineers is notable because of present concerns about shortages and competition for engineering graduates."¹¹

For the period from 1982 to 1986, an additional 700 engineers will be needed to deal with the nuclear industry's growth, and 2,200 to meet replacement requirements, the Oak Ridge study noted. For the period from 1987 to 1991, an additional 800 engineers will be needed for industry growth, 2,300 for replacements.¹² However, there are serious questions that this total of

6,000 engineers will be trained in time. The number of engineers graduating from American colleges and universities has risen steadily since the mid-fifties, the American Society for Engineering Education reported.¹³ Yet enrollment for nuclear engineers has declined since the mid-seventies. Nuclear engineering enrollment peaked in the 1977-78 academic year for bachelor's degree candidates and has declined steadily since then. Enrollment for doctoral and master's degrees had begun to decline at the nuclear-engineering departments of colleges and universities by the 1975-76 academic year: such declines were less dramatic than for the bachelor's degrees, in large part because of rising enrollments by foreign nationals. In nuclear engineers degrees awarded for the 1979-80 academic year, for example, foreign nationals received 5 percent of the bachelor's degrees, 28 percent of the master's degrees, and 42 percent of the doctoral degrees.¹⁴ In the 1979-80 academic year, a Nuclear News survey reported, 656 bachelor's degrees were awarded in nuclear engineering. That year 366 master's degrees and 116 doctoral degrees were awarded.¹⁵

Assuming that these graduate levels held steady (and there are indications they will drop further), the total number of graduates produced between now and 1990 to meet the 1991 level of 6,000 engineers would be about 9,000 -- a barely adequate reserve. Here perceptions will be important. An industry that appears to be in decline will simply not attract qualified graduates; or, those it will attract are not likely to be the most creative or best qualified. Too, as an Energy Department study noted, quoting nuclear physicist Freeman Dyson: "The fundamental problem of the nuclear power industry is not reactor safety, not waste disposal, not the dangers of nuclear proliferation, real though all these problems are. The fundamental problem of

the industry is that nobody any longer has any fun building reactors....Sometime between 1960 and 1970, the fun went out of the business. The adventurers, the experimenters, the inventors, were driven out, and the accountants and managers took control....We are left with a very small number of reactor types in operation, each of them frozen into a huge bureaucratic organization that makes any substantial change impossible, each of them in various ways technically unsatisfactory, each of them less safe than many possible alternative designs which have been discarded. Nobody builds reactors for fun anymore....That, in my opinion, is what went wrong with nuclear power."¹⁶

Restoring that missing sense of fun may be impossible for years. But, assuming that new vigor can be inspired, and that demand for trained workers increases, the serious question remains: Where will they come from? Probably many of the skills will need to be taught by the nuclear industry itself. Some utilities already sponsor training courses at local community colleges and technical schools. Alternatively, nuclear professional associations may be called upon to create and administer training courses, drawing on specialists still in the business or recently retired.

The most likely source of nuclear skills and services would be the firms that had continued to support operating plants and federal nuclear programs. This would give a strong competitive advantage to the firms that had managed to stay in the business, although they might be the firms with the most antiquated designs and equipment. They would, however, probably possess the most flexible pool of skilled manpower for a revitalized nuclear industry.

Absent some new technology in the field, welding would pose the greatest

problem for new-plant construction. Skilled welders are in short supply today, and would be even scarcer in a decade or two. Industry and/or federal training programs would probably be required. Control and instrumentation technology -- and workers -- would probably be readily available from the electronics and aerospace industries. Semi-skilled construction and maintenance workers would also be available, contractors estimate today. "The big problem with start-up would be administrative," an architect-engineering executive said, "just controlling the thousands of decisions and tasks" needed to construct and test a nuclear plant. In addition, he warned, "scheduling inspections could be a nightmare -- it certainly is today."

7. Current Attitudes and Future Prospects

In general, the most significant unknown factors clouding the future of nuclear power in the United States are uncertain electricity demand, unpredictable regulatory and political climates, and uncontrollable economic conditions. Market forces alone are not expected to compel utilities to build new nuclear power plants; some form of federal -- and state -- encouragement will probably also be needed. "We're not sure what the government posture is today, let alone what it will be in five or ten years," one utility executive said. "And without a firm commitment by the federal establishment, utilities will have no incentive to be in the nuclear business. In a sense, the federal government got us into the nuclear business. Well, the federal government still has the power to keep us in -- or to drive us the hell out."

One assumption ruling utility-industry speculation is that the Federal government would probably try to foster a utility-run nuclear plant revival before embarking on an ambitious nuclear program of its own.

Reactor vendors consider their chief tasks during the hiatus of new-plant

orders to be two-fold: improving the performance of existing plants, through increased capacity factors and fuel efficiency; and enacting licensing reforms that would allow greater standardization.

Architect-engineers fear that the regulatory requirements imposed by the NRC, a source of much-needed business today, could ultimately stifle the utilities, and, eventually the other nuclear-industry sectors as well.

Suppliers, by and large, expect their involvement in the nuclear business to decline: predictably, those most heavily involved think they will suffer the most -- and the soonest. And suppliers say they are likely to be much more skeptical about re-entering the nuclear business if new-plant orders resume. Too, many expect that if the economy does recover from the current recession, other industries will offer them lucrative opportunities before the nuclear industry does.

Of course, with an enterprise as complicated as nuclear energy, contrary pressures will occur. One supplier of specialized parts said that he is hanging on to his ASME quality-assurance certificates precisely because business looks bad in the nuclear sector: he reasons that competitors will drop out leaving the remaining work for him. In fact, he noted an increasing number of "unpriced" orders from architect-engineers and utilities -- with "advise delivery date" and "advise price" the extent of the purchaser's request. "I won't say they don't care about when they get it or what they pay," he said. "It's just that they know they can only go to a few places for what they want. They'll take what they can get, when they can get it."

Ironically, the Three Mile Island accident, which has harmed the imag-

and long-range prospects of nuclear power, is responsible for much of the work now under way -- through backfits, repairs, and safety improvements. In that sense, the accident has helped vendors, architect-engineers, and suppliers, but at the expense of the fourth sector, the utilities. If this sort of business persists, of course, the long-range prospects of all industry sectors will suffer.

Furthermore, for all the speculation today about the viability of the nuclear option, some planning decisions need to be made by utilities later in this decade and these may signal the start of a later revival. Reserve margins, which are comfortable in most regions of the country, can be uncertain as plants age. On the other hand, Canadian electricity promises to be available and competitively priced in the area from the upper Midwest to New England; conservation strategies are in many cases cheaper than new-plant construction; and opportunities exist for utilities to buy into nuclear plants now under construction. Thus, it appears to many in and around the nuclear industry that the infrastructure may have declined significantly even before there are serious considerations about its survival.

With a sense of resignation, then, many industry members expect that the early revival of nuclear power will be influenced as much by the technology and financial terms of overseas suppliers as by the U.S. firms remaining in the market.

Utilities seem resigned to finishing the nuclear plants now under construction, then operating them for expected (and perhaps extended) periods. The "penalty" now imposed by regulatory bodies for operating nuclear plants is just too stiff, many believe. As one utility executive, who just

cancelled a nuclear unit, said: "The cheapest power I can buy right now comes from Canada, then from converting our oil-burning units to coal, then from buying into a neighboring nuclear unit, then from building new coal-fired plants, and only then from a new nuclear unit of my own. Until the costs and times and regulations are clearer, I'm not looking at another nuclear plant."

Some bargains are available from utilities selling the components of their cancelled plants, but there is hardly a flourishing market in such items. Inventory sharing, a limited convenience, might become more widespread if the nuclear industry revives: then more and more parts and plants could be matched in a nationwide marketing scheme. Today, where parts are available, they may be priced at less than half their original costs. But unless quality-assurance documents, warranties, and accessories are also maintained, such cut-rate items are of little value. As a result, many parts from cancelled plants are simply scrapped, despite their superb quality and high costs.

Today items made for plants that have been deferred or cancelled have little or no resale value. However, if standardized plants were to become a reality, such secondary markets could help significantly to reduce nuclear power's costs, some vendors believe.

Utility executives warn that one unfortunate side-effect of a new-plant hiatus is that by the middle of the next decade existing facilities will be showing their age. "Low load growth means no additional plants right now," one utility executive said. "That's O.K. for now. But pretty soon we'll end up with all our capacity 30 to 40 years old. Then we'll have to think of replacing it all at once." One way around this, he said, is for states to

allow construction-work-in-progress to be applied to their rate base.

For nuclear plants to seem attractive, as they once did, another utility executive said, a new relationship must be established with the state regulators. "We've got to cut out this adversarial situation," he said, "It's got to be more of a partnership." In fact, "partnership" is also a word utility executives use when discussing the federal role in new-plant orders. Unlike the Fifties and Sixties, however, if cooperative ventures are undertaken the driving force may be the nuclear industry -- eager for help -- rather than the government seeking new and "peaceful" ways to use the atom.

Vendors see fuel and engineering services as ways to survive in the nuclear business for several years. Foreign business, and backlogs due to NRC-ordered backfits, may also help briefly. But for the most part nothing short of several new-plant orders a year will save them in their present form.

The vendors look to the Federal government for help: with low-interest export loans; with research-and-development funds; with public policies that encourage the nuclear option; and with clearer waste-disposal programs.

Regulatory reform, including "one-stop licensing" to replace the two-stop procedure of obtaining construction permits and operating licenses, is deemed to be essential for any sustained revival of nuclear power in this country. And yet, as one utility executive said, "One-stop licensing could just tie you up for longer at that one stop -- especially if your critics convince the regulators that this is the only place their concerns can be addressed."

New-plant designs, if they are made, will increasingly come from joint ventures with foreign utilities or manufacturers, the vendors believe, such as

the projects that General Electric and Westinghouse have with the Japanese. Similarly, if another breeder-reactor demonstration plant is designed, it will probably be sponsored by overseas investors.

Architect-engineers are finding that with nuclear work declining other power projects offer a promising alternative: cogeneration; geothermal, solar, and coal technologies; petrochemical plants; industrial process-heat applications; and, increasingly, conventional power projects abroad.

They complain that the choices available to them for purchasing nuclear-grade equipment are diminishing rapidly in this country, and expect more foreign N-stamp items to be common within a few years.

Business today depends on backfit work, and on the instability of nuclear regulations in general -- two conditions that cannot persist for long without destroying the nuclear option. On the other hand, without such work the architect-engineers' share in the nuclear business would be declining more rapidly.

Layoffs are less a problem than many suppose, one architect-engineering executive said, because many employees are just quitting on their own: retiring early, or moving to fields with more growth potential and less regulation, such as military research and development.

In the absence of new-plant business, one promising concept for interim survival involves "recommissioning" nuclear stations -- installing some new components to extend their operating lives by 10 to 20 years.

Steam-generator work, the most widespread complaint among utilities, also

promises to keep some architect-engineering firms busy. A general economic recovery will probably produce new work in non-nuclear areas long before the nuclear business reviv's, one architect-engineering executive said. "As it is now, we can't move our nuclear people to non-nuclear projects just to keep them in-house. There isn't much non-nuclear work around either," he said. However, assuming that an economic recovery of some sort is in the making, fossil-fuel plants are likely to be built long before any new nuclear orders are placed.

Suppliers are probably the most sensitive to a downturn in nuclear business, and the most likely to desert the nuclear option if other economic sectors recover first. Backlogs from post-TMI work are all but completed, and exports hold little immediate promise. But U.S. defense contracts offer an attractive alternative to nuclear work for many suppliers. Too, aerospace and health industries are mentioned frequently as possible areas for diversity, especially because they have exacting quality-control requirements of the sort that nuclear suppliers are used to meeting.

To suppliers who want to remain in the nuclear business, the challenge isn't to sell their products overseas, but to keep imports from dominating U.S. markets that still exist. "If equipment from overseas becomes standard," one supplier said, "we'll never get that business back." As a hedge against such competition, some suppliers are increasingly affiliating with manufacturers overseas through patent-sharing or leasee and licensee agreements. "To my surprise," one supplier said, "the product made over there was superior to one we made here -- though it cost a little more."

The downturn in business has brought more bidders out to try for

available contracts. However, price is not the most important factor to many customers. "Companies aren't always taking the low bids," one supplier of specialized nuclear components said. "They're scared about quality-assurance problems, and they're sticking with the most reliable products. I think they know, the cost of a valve or pipe failure could bring the whole plant down, and they don't want to run the risk."

For their part, the suppliers don't want to run the risk of bad publicity from the failure of one of their products either. In many cases they would prefer to retire their N-stamps and quit the nuclear business rather than stay in for marginal profits. "A lot of utility presidents don't want their names attached to a nuclear plant anymore," one component supplier said. "Well, I don't want the name of my valve connected with it either." Many suppliers would rather develop markets in other energy areas -- industrial cogeneration, paper-industry applications, hydro-power -- than remain in the nuclear business. Furthermore, those who plan to remain expect that nuclear work will provide a diminishing share of their business in the immediate future. Those who plan to remain are also looking to new nuclear applications for their products, waste-management technologies, for example, or inspection and quality-assurance work.

Many suppliers report government or industry pressure to retain their certifications and remain in the nuclear business. But they also complain about the mounting paperwork. "I make a valve that sells for about \$300," one supplier said. "If it has an N-stamp I have to charge \$4,000 for the same thing. And with low volume, I suppose I should charge even more." Such complaints are common. If paperwork becomes more onerous, many suppliers say,

they will simply let their N-stamps expire when they come up for renewal. A few suppliers talk of reconsidering the N-stamp every quarter, the prospects for new nuclear business are so tentative.

On the other hand, should a revival in new-plant orders occur, the suppliers could probably re-enter the market within two years. That, some suppliers estimate, is the most of time it would take to assemble a design and production team, qualify for an N-stamp or quality-assurance certification, and send out a sales force. But once in business again, production may well take longer than it does today. "Right now," one supplier said, "my people know just who to call for an interpretation of the regulations. They know which seismic-stress labs are the best. If we had to start over [several years hence], a question that takes an afternoon on the phone to answer today would take three to four months to answer."

Suppliers say that some of their products may become obsolete without new forms of federal assistance for research and development work -- low-interest loans, perhaps, or contract work through the national laboratories.

Indeed, working for the government -- at an energy park or large nuclear park of the future -- holds some appeal for many suppliers. Yet uncertainties about federal work still persist. "If it's like working for TVA [the Tennessee Valley Authority] it's great," one supplier said, "But if it's like working for the Postal Service, then forget it."

8. Conclusions

If rational and simple calculations applied, or if economics alone applied, the nuclear industry in the United States would have many fewer

participants than it does today. But rational and simple calculations, and economics, don't always apply -- and probably can't. That is because for many participants, being part of the nuclear industry, continues to be an act of faith. Nuclear power will become more economical, safer, and necessary, they believe. And so, they hang on: waiting for the revival that some observers think is just around the corner, and that others think may never come at all.

How long they can wait is the unanswerable question that confounds nuclear planners -- and industry participants -- today. Many suppliers have already quit; others are about to. Larger firms may soon follow. What then?

Some firms are taking losses to keep their skilled nuclear people employed, because they estimate that retraining would ultimately cost them more: architects are working as draftsmen, skilled machinists are cutting and stacking sheet metal. This cannot last for many months or years, however. In a year or two, and maybe sooner, some of these skilled nuclear workers will be laid off, or assigned to entirely new activities. "The nuclear industry has been good to us," one supplier of specialty steel products said, "and you just don't write it off." That faith and loyalty, more than the promise of exports or the expectation of renewed domestic nuclear-plant orders, is what holds much of the industry together today.

The irony is that what little business there is today stems largely from the nuclear industry's troubles: backfit work to correct problems discovered during and after Three Mile Island; regulatory requirements that hold little coherent purpose; repairs to equipment that was designed or made poorly.

Furthermore, if the long-awaited economic recovery occurs, as nuclear

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industry officials hope, they will be among the last to benefit -- and may, in fact, become its temporary or permanent victims. For, the recovery is likely to create work and jobs in most other industries before electricity demand rises and stays high, before utilities decide their reserve margins must be increased and before new generating capacity -- perhaps nuclear -- is ordered, designed, built, and installed. Thriving on adversity today, the nuclear industry could nearly perish in the good times just ahead. "If the economy revives," one supplier said, "I'm not sure I can wait around for the nuclear contracts to roll in. I may be doing something else in the meantime."

FOOTNOTES

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SURVEY OF MAJOR NATIONAL
GROUPS INFLUENCING PUBLIC
OPINION AGAINST NUCLEAR POWER

Contractor Report to the
Office of Technology Assessment
Congress of the United States

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This report was prepared for the Office of Technology Assessment, Congress of the United States, under contract 333-3950.0. The opinions, findings, and conclusions expressed are those of the contractor and do not necessarily reflect the views of the Office of Technology Assessment. The organizations surveyed also may not agree with all of the characterizations and opinions expressed in this report.

Foreward

This report summarizes the results of the author's interviews of organizational representatives and his reading about the policies, activities and resources of the major national organizations in the United States attempting to influence public opinion against at least some aspects of commercial nuclear power. Omitted from this analysis are the numerous local groups, including chapters and subunits of the national organizations surveyed, that actively oppose the construction and operation of specific nuclear power plants and related facilities. Major figures (e.g., Ralph Nader, Amory Lovins, John Holdren), who also may greatly influence public opinion on questions concerning nuclear power as individuals, and individual members of the national organizations surveyed are not considered outside the context of their activities on behalf of the major national organizations. The League of Women Voters of the United States, moreover, is considered in a separate report at the request of the Office of Technology Assessment.

The author was for many years a senior staff member with one of the organizations (Natural Resources Defense Council, Inc.) considered in this report. Although his staff affiliation ended almost three years ago, this experience and his continuing support for environmental organizations may have inadvertently colored the results of the survey, despite attempts to be fully objective and analytical. This experience, nonetheless, has provided the author with information by which to judge the significance or

accuracy of statements made by organizations and their
representatives and by other analysts.

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A. Introduction

For several years after President Eisenhower announced the federal government's "Atoms for Peace" program, there seemed to be broad national support for the construction of nuclear power plants to generate electricity "too cheap to meter." In the early 1960's many environmentalists, perhaps a majority, supported development of nuclear power. David Brower, when he was the Sierra Club's executive director and before he founded Friends of the Earth, preferred nuclear power plants to dams in the Grand Canyon, which were the pre-eminent environmental issue at that time. Some pro-nuclear scientists and engineers, in fact, were prominent environmental leaders. For instance, Dr. W. Kenneth Davis, who until recently was Deputy Secretary of Energy, served on the Sierra Club's Board of Directors and Dr. Lawrence I. Moss became the Sierra Club's president.

Concerns about the routine emissions of radiation from the power plants, thermal pollution, the possibility of catastrophic releases of huge quantities of radioactivity from reactors, and the need to isolate radioactive wastes for thousands of years, however, eventually changed that initial support (or at least official neutrality) into organizational opposition. By the mid-1970's the Sierra Club's Board of Directors, for example, had shifted its position of neutrality to one favoring the phase-out of commercial nuclear power plants. During the 1971-73 period, environmental groups, which only recently had been formed or newly invigorated, generally became active in opposing at least some

aspects of nuclear power development through lawsuits, lobbying, public education, and publicity.

With this shift in opinion on nuclear power by environmental groups, a strong sense of distrust and antagonism developed, perhaps reflecting the fact that nuclear power had become a political issue. The debate may have taken on this emotional aspect in part because of the general mood created by the alienation during the Viet Nam War and the Watergate affair. Whatever the cause, deep emotions were aroused, and the debate became bitingly adversarial. The sense of distrust still exists. Many who oppose aspects of nuclear power frequently suspect the motives of nuclear power advocates, as well as strongly disagreeing with their technical judgments. Nuclear opponents have a deeply felt lack of confidence in the government-industry nuclear complex.

This feeling of distrust and suspicion colored the interviews conducted for this survey. Concern over possible misuse of the information gathered was frequently expressed. In particular, budget figures for nuclear power activities are not presented for all surveyed organizations, for instance, because they were estimated for the author on the basis that they not be published individually.

Opposition to nuclear power is now deeply entrenched in the environmental and citizen activist communities. This opposition, furthermore, is not narrow, either in terms of its constituency or in its range of concerns. Changing the current positions of these groups, therefore, would not be simple or easy. Adjustments over

a period of several years probably would be necessary before there could be a significant diminution in their concerns and opposition.

There has been a slow, steady erosion of public support for nuclear power. To the extent critics find and publicly explain the drawbacks and dangers of nuclear power further, this trend will be encouraged. To a large extent, the news media and the public are reacting to the existence of vociferous disagreement, and not to the substantive merits of the arguments. Acceptance and accomodation of at least some of the opponents' concerns by the nuclear government-industry complex would diminish that visible disagreement and, thereby, in some measure reduce the public's reluctance to support nuclear power. Further public and vigorous debate would likely have the opposite effect.

Those who want a prosperous future for commercial nuclear power will have to take the views and findings of nuclear critics and opponents seriously and modify their programs accordingly. Rejuvenation of the nuclear power industry, in fact, seems unlikely unless there is an accomodation of the concerns of those who can and will continue to influence public opinion against nuclear power. Many of the concerns that these groups have identified already have become widely and at times officially recognized as legitimate. The public continues to hold environmentalists in high regard, according to opinion polls, and environmental organizations are remaining strong.

B. Identification and Description of Major National Groups

1. Introduction

There are eleven major national organizations in the United States purposefully influencing public opinion and governmental policy against at least some aspects of commercial nuclear power as it is being implemented today. These groups are diverse in their detailed views on nuclear power, the types of activity used to push their views, and their organizational structures and sizes. Despite these differences the staff members who work on nuclear power issues stay in close communication with each other, and there is substantial cooperation and mutual support at the working level. All of the national organizations either are headquartered in Washington, D.C., or have major offices there, which greatly aids this exchange of viewpoints and information.

The groups are financially sustained by a broad variety of funding sources, including individual contributions, membership dues, foundation grants, sales, bequests, and government contracts. The larger organizations derive much of their income from membership dues. The National Audubon Society, for instance, for the fiscal year ending June 30, 1982, obtained about one-third of its income from dues.¹ Income from a large membership base is particularly stable, enabling the organizations to pursue issues that may at a given moment be out of fashion with foundations, corporations or government.

All of the organizations can be placed into one of the

following two general categories:

1. Environmental Groups

- o Environmental Action
- o Environmental Defense Fund
- o Environmental Policy Institute²
- o Friends of the Earth
- o National Audubon Society
- o Natural Resources Defense Council
- o Sierra Club

2. Energy Groups

- o Critical Mass Energy Project
- o Safe Energy Communication Council
- o Nuclear Information and Resource Service³
- o Union of Concerned Scientists⁴

Within each category there are substantial differences among the organizations. Some of the organizations, indeed, may see the differences as more significant than the commonalities.

The environmental groups usually have a long, varied agenda of issues that are being simultaneously addressed by their staffs. Typically, nuclear power issues are not among their top priorities. For instance, in terms of its program expenditures, the Natural Resources Defense Council puts nuclear power only seventh or eighth. The National Audubon Society may spend less than 1 percent of its annual budget directly on nuclear power issues.

This relatively low rank of expenditure on nuclear power activities by the environmental groups does not necessarily indicate the relative importance of nuclear issues in terms of the environmental threats perceived by their staffs, members, or boards, however. Indeed, some of the interviewees expressed the desire to spend more on nuclear power issues. But, the budget priorities of the environmental groups are set by several forces.

For instance, the importance and opportunities to work on other major environmental issues, interests of dues-paying and activist members, willingness of foundations to make grants, the likelihood of affecting an outcome by using staff skills and other resources, and the timeliness of possible actions are important considerations in shaping budgets. Environmental groups, in fact, are mostly responsive to the forces external to the staffs such as the concerns of their members and governmental programs.

The energy groups are focused to a greater extent on nuclear power. They are also generally smaller and more activist oriented, and publicly they usually take more extreme views on the hazards posed by nuclear power. Their financial bases are less diverse, due to their more restricted focus on nuclear power issues; and they seem also to have less broad political support, perhaps due to the relative extremeness of their views. With the exception of the Union of Concerned Scientists, all of the energy groups essentially devote their entire resources to opposing commercial nuclear power.

The size of the groups within each category varies greatly. For instance in 1981, the annual expenses of the National Audubon Society were over \$19 million, but the corresponding figure for the Friends of the Earth (including its foundation) was about \$1.8 million. Among the energy groups, the Safe Energy Communication Council currently has an annual budget of only \$80,000, while the Union of Concerned Scientists now spends about \$2.7 million yearly.

There are important management differences, too. The Sierra

Club, for instance, is ruled by a Board of Directors elected by its dues-paying members from among themselves. The Natural Resources Defense Council, by contrast, has a self-perpetuating Board composed of Trustees who are more notable for their national reputations and prestige than for their grass roots activity on behalf of the organization. Most of the organizations seem not to be rigidly managed by either their boards or staff directors, nor is conformity on all policy positions required of their staffs. Particularly in the large organizations it is possible to find among the personnel significantly different views on important points concerning nuclear power policy. Staff members are often individual entrepreneurs within their organizations; they usually can begin projects on their own initiative if adequate funding is available. Restrictions on the targets of their activities seem to be minimal, although there is strong pressure to maintain high standards for the quality of their work. This type of loose-knit organizational structure seems to contrast dramatically with the nuclear industry's organizations and the governmental agencies supporting nuclear power development.

Some groups, such as the Union of Concerned Scientists, have experienced staffs with credentials as experts. Others, such as the Nuclear Information and Resources Service, have staffs that are skilled in communication and education, but they do not produce original expert opinion and studies.

2. Descriptions

The eleven organizations surveyed for this report are broadly described below. The purpose here is to present an

overview of the diversity in types or organizations concerned about nuclear power and description of the range of the organizations' activities.⁵ Their activities specifically focused on nuclear power issues are described in some detail in Section D, below.

The listed expenditures generally come from the most recent annual report, which usually means that the expenditures occurred in 1980 or 1981, rather than 1982. In three cases (Environmental Policy Institute, Safe Energy Communication Council and Union of Concerned Scientists) the annual expenditures were obtained orally from staff. Some of the organizations are growing or changing so that the annual expenditures listed below may only be rough approximations of current budgets.

a. Critical Mass Energy Project/Public Citizen, Inc.

Founded in 1974 by Ralph Nader, the Critical Mass Energy Project is one of the organizations under the umbrella of Public Citizen, Inc. Public Citizen, which was started by Ralph Nader in 1971 to promote citizen rights, depends on individual contributions from "tens of thousands of concerned citizens." The Critical Mass Energy Project, started "in the belief that a Critical Mass of people can make the critical difference in the fight for safe energy," is a national consumer organization that monitors the activities of governmental agencies, industry and Congress on nuclear energy, renewable energy resources, and energy conservation. Information is provided to grass roots groups, anti-nuclear citizens and the press. Critical Mass Energy Project also serves as a national clearinghouse and network of

anti-nuclear activity.

Approximate Annual Expenditures:

Critical Mass Energy Project	\$ 210,000
Public Citizen, Inc.	\$ 1,300,000

Major Topics Recently Addressed:

Critical Mass Energy Project
All major topics concerning
nuclear power, renewable energy
resources and energy conserva-
tion

Public Citizen, Inc.

In addition to the Critical Mass Energy Project,
Public Citizen sponsors four other groups:

- o Health Research Group
- o Congress Watch
- o Litigation Group
- o Tax Reform Research Group

b. Environmental Action/Environmental Action Foundation

Established in 1970, Environmental Action and the Environmental Action Foundation are legally separate "sister" organizations. Environmental Action lobbies at both the federal and state levels, and it supports environmental candidates.

Contributions to Environmental Action are, therefore, not tax deductible. Environmental Action obtains about 60 percent of its income from membership dues, with most of the rest coming from contributions. Environmental Action has about 20,000 members.

The Environmental Action Foundation, on the other hand, is a public foundation that provides technical and organizational assistance to local activists on complex environmental and energy issues. It does not engage in lobbying or support political candidates. Contributions to the foundation are tax-deductible.

Approximate Annual Expenditures:

Environmental Action	\$ 500,000
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Environmental Action Foundation

375,000

Major Topics Recently Addressed:

Environmental Action

Nuclear Power, Clean Air, Returnable
Bottles, and MX

Environmental Action Foundation

Waste and Toxic Substances, and
Nuclear Power

c. Environmental Defense Fund, Inc.

Founded in 1967, the Environmental Defense Fund is a not-for-profit, non-partisan membership organization dedicated to protecting and improving environmental quality and public health. The Environmental Defense Fund works towards its objectives through research and public education, and judicial, administrative, and legislative action. The Fund has approximately 50,000 members. Membership dues and gifts from members account for about 60 percent of the Fund's income, and foundations provide another 32 percent.

Approximate Annual Expenditures:

\$ 2,600,000

The Environmental Defense Fund runs the following four programs:

Energy Program

- o Utility Investment
- o Acid Rain
- o Western Energy
- o Coal Conversion

Wildlife Program

- o Marine Mammals
- o International Conservation
- o Endangered Species
- o Wildlife Refuges

Water Resources

- o Wetlands
- o Water Conservation
- o Bottomland Hardwoods
- o Ports and Estuaries
- o Groundwater

- o Rivers

Toxic Chemicals

- o Hazardous Waste Disposal

d. Environmental Policy Institute

Founded in 1974, the Environmental Policy Institute develops information needed for informed public participation in environmental and energy decisionmaking. It conducts research and monitors the federal government's implementation of key environmental and energy laws. (Previously, the Environmental Policy Center, the lobbying arm, was a separate organization. In 1983, the Center became a project within the Environmental Policy Institute. The amount of lobbying is restricted in order not to jeopardize the tax status of the Institute.)

Approximate Annual Expenditures:

Environmental Policy Institute

\$ 1,000,000

The work of the environmental Policy Institute is conducted through the following eight projects:

- o Citizens Mining Project
- o Energy Conservation Project
- o Public Lands Resource Project
- o Rural Land and Energy Project
- o Synthetic Fuels Assessment Project
- o Water Conservation Project
- o EPA Monitoring Project
- o Nuclear Power and Weapons Project
 - Nuclear Cargo Transportation
 - Nuclear Waste Storage
 - Nuclear Industry Liability and Insurance
 - Radiation and Health
 - Weapons Testing and Production

e. Friends of the Earth/Friends of the Earth Foundation

Founded in 1969, Friends of the Earth is a multi-national organization committed to preservation, restoration and rational use of the earth. Friends of the Earth lobbies, files lawsuits, endorses candidates and grass roots organizes. Contributions to Friends of the Earth are not tax-deductible. Friends of the Earth has over 30,000 members.

The tax-deductible "sister" organization was established in 1972. Friends of the Earth Foundation conducts research, publishes reports and books, and it holds symposia, conferences and workshops to improve the quality of the human environment.

Approximate Annual Expenditures:

Friends of the Earth	\$ 1,100,000
Friends of the Earth Foundation	\$ 740,000

Major Topics Recently Addressed:

Friends of the Earth
Alaska Lands, Bryce Canyon,
California Coast and Coastal Planning,
Nuclear Power, MX Missile, Pesticides
and Toxic Chemicals, Wildlife,
California Water, Oil Shale, Clean
Air Act, Public Works Projects,
Public Lands and Rivers, and
Organic Farming

Friends of the Earth Foundation
Soft Energy Technologies,
Nuclear Power, Carbon Dioxide,
Acid Rain, MX Missile, Condors,
Alaska, California and Alaska Outer
Continental Shelf, Toxic Waste,
Public Lands and Soil Conservation

f. National Audubon Society

Founded in 1905, the National Audubon Society is a membership conservation organization that seeks to protect essential natural systems and to preserve wildlife and important

natural areas. The Society, with about 500,000 members, is by far the largest organization included in this survey. The National Audubon Society conducts research, provides information and undertakes litigation, political action and administrative lobbying. About 25 percent of the Society's annual revenues are derived from membership dues, and another 25 percent comes from grants and contributions. The remaining 25 percent is obtained from a large variety of sources, ranging from bequests to royalties.

Approximate Annual Expenditures: \$20,500,000

Major Topics Recently Addressed:

Wildlife and Life-Support
Systems, Energy Development
and Use, Air Pollution, Water
Pollution, Toxic Substances,
Hazardous Wastes, Noise Pollution,
Pesticides, Radiation Exposure,
Land Use, Water Conservation, and
Population

g. Natural Resources Defense Council, Inc.

Established in 1970, the Natural Resources Defense Council is a national law and membership organization dedicated to protecting endangered natural resources and to improving the quality of the human environment. The Natural Resources Defense Council monitors and lobbies government agencies and Congress, conducts research and publishes studies, files lawsuits, and disseminates information to the public. The Council has over 32,000 members. About 44 percent of the Council's revenues come from its membership, while foundations provide about 37 percent.

Approximate Annual Expenditures: \$ 5,000,000

Major Topics Recently Addressed:

Air Pollution, Water Pollution,
Toxic Substances, Proliferation
of Nuclear Weapons, Nuclear
Energy, Energy Conservation,
Urban Environment, Public Lands,
Forestry, Alaska Lands, Coastal
Zone, Farmland, Endangered
Species, and the International
Environment

h. Nuclear Information and Resource Service

Founded in 1978, the Nuclear Information and Resource Service is a national organization committed to the phase-out of nuclear power plants and nuclear weapons. The Nuclear Information and Resource Service disseminates information and educational materials to concerned citizens, public officials, educators and the press, and it maintains a national clearinghouse for citizens' groups and nuclear critics.

Approximate Annual Expenditures: \$ 170,000

Major Topics Recently Addressed:

All major topics concerning
nuclear power and nuclear
weapons

i. Safe Energy Communication Council

The Safe Energy Communication Council, a coalition of national environmental, renewable energy and public interest media groups, was founded in 1982 primarily to counter pro-nuclear advertising by the Committee for Energy Awareness in the mass news media. The Safe Energy Communication Council distributes media resources, produces radio, TV and print advertisements and assists

groups in developing media skills.

Approximate Annual Expenditures: \$ 80,000

Major Topics Recently Addressed:

All major topics concerning
nuclear power, renewable energy
resources and energy conserva-
tion

- j. Sierra Club/Sierra Club Committe on Political
Education/Sierra Club Foundation/Sierra Club
Legal Defense Fund

Founded in 1892 by John Muir, the Sierra Club is the oldest major national environmental organization that influences public opinion against nuclear power. The Sierra Club (1) promotes exploration, enjoyment and protection of wild places on earth, (2) encourages the responsible use of the earth's ecosystems and resources, (3) educates and enlists humanity to protect and restore the quality of the natural and human environment. The Sierra Club lobbies, files lawsuits, publishes and disseminates information, holds conferences and workshops, and conducts outdoor and wilderness trips. The Sierra Club has over 325,000 members.

The Sierra Club Committee on Political Education was established in 1976 to support environmental candidates.

The Sierra Club Foundation is a public foundation for the principaal purpose of supporting the Sierra Club's non-legislative activities.

The Sierra Club Legal Defense Fund represents the Sierra Club in environmental litigation and regulatory proceedings.

Approximate Annual Expenditures:

Sierra Club	\$11,200,000
Sierra Club Committee on Political Education	\$ 3,500,000
Sierra Club Foundation	\$ 1,800,000
Sierra Club Legal Defense Fund	\$ 1,400,000

Major Topics Recently Addressed:

Air Pollution, Wilderness,
Nuclear Waste, National Parks,
Water Projects, National
Forests, Clinch River Breeder
Reactor, Coastal Zone, Endanger-
ed Species, Alaska, Public Lands,
Population, Urban Waterfront,
International Environment

k. Union of Concerned Scientists

Founded in 1969 (incorporated in 1973), the Union of Concerned Scientists focuses on America's energy program and nuclear arms control. The Union of Concerned Scientists promotes public education through reports, books, films and conferences; files lawsuits; participates in regulatory proceedings; and lobbies. About 80 percent of the Union of Concerned Scientists' budget is contributed by individual sponsors. There are currently over 150,000 sponsors who make regular financial contributions.

Approximate Annual Expenditures:	\$ 2,700,000
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Major Topics Recently Addressed:

Nuclear Power Safety,
National Energy Policy, and
Nuclear Arms Control

FOOTNOTES TO SECTION B

¹ Another third of Audubon's income came from foundation grants and contributions, while the last third was derived from a diversity of activities, ranging from investment income to bequests.

² The Environmental Policy Institute and its affiliated organization, the Environmental Policy Center, were being restructured when this report was in preparation. Thus, the final structure of the combined organizations and their activities may not be accurately reflected herein.

³ The Nuclear Information and Resource Service provides information on both nuclear weapons and nuclear power issues, although the emphasis is on commercial nuclear power.

⁴ The Union of Concerned Scientists also has a major focus on arms control, constituting somewhat over one-third of program expenditures in FY81, which ended on February 28, 1982.

⁵ For the purposes of this report, closely related organizations are counted as one, even though they may have separate boards or staff directors and officers. Each of these "sister" organizations has a separate purpose, but their activities are usually coordinated and conducted in mutual support of each other. The Sierra Club, the Sierra Club Committee on Political Education, the Sierra Club Foundation and the Sierra Club Legal Defense Fund, for instance, are considered one organization in this report, although legally they are separate entities.

C. Summary of Nuclear Power Issues of Concern to Major National Groups

1. Introduction

The list of major nuclear power issues addressed by the national groups surveyed for this report is long. The environmental, public health, economic and sociopolitical objections currently being addressed by one or more of the national organizations can be grouped into seven major categories.¹ These categories are listed below in rough order of importance to those who were interviewed for this report. Simplistic conclusions should not be drawn from this subjective ranking by the author, however, since these rankings would vary among organizations and they probably change over time.

1. Nuclear Waste Disposal.
The long-lived radioactive wastes inevitably produced by nuclear power may escape into the environment before they have decayed to innocuous levels. Such releases of radioactivity pose a serious threat to the health of generations far in the future.
2. Nuclear Weapons Proliferation.
Nuclear power may hasten the spread of nuclear bombs worldwide, increasing the likelihood of their use by subnational groups or small nations in the near future.
3. Reactor Safety.
Reactors may have catastrophic accidents killing thousands of people.
4. Economics and Reliability.
Nuclear power plants are too costly and unreliable, particularly in comparison with improvements in the efficiency of energy use ("conservation") and "soft" renewable energy technologies. Nuclear power facilities are not a cost-effective use of ratepayers' and taxpayers' monies.
5. Transportation Safety.
Accidents during the transportation of spent nuclear fuel and radioactive wastes may release vast quantities of radioactivity in populated areas.

6. Low-Level Radiation.
Low levels of radioactivity are routinely released from nuclear power plants and the fuel cycle, increasing cancer rates and degrading the general environment.
7. Civil Liberties.
Nuclear power centralizes political and economic power to the detriment of the average person, and the necessity of protecting nuclear facilities reduces the civil liberties of employees and others.

Reactor safety and radioactive waste disposal have been major concerns for many years, and they still rank among the top of the list for all of the major national organizations surveyed. The possibility of furthering the spread of nuclear weapons is also now a top concern of all of the groups.

The current focus on the economic costs of nuclear power plants in comparison to alternatives, including coal-fired power plants, is relatively new and growing in importance. Economic issues, which include assessments of plant reliability, are addressed largely in state government forums, rather than at the federal level. Although representatives from national groups occasionally testify in state regulatory proceedings on economic issues concerning conventional nuclear power plants, the major function of the national groups is to supply information to local organizations to assist them with their interventions before public utility commissions and the Nuclear Regulatory Commission.

Generally speaking, concern about low-level radiation has diminished since the early 1970's, when the Nuclear Regulatory Commission (then the Atomic Energy Commission) reduced the amount of radiation permitted from a nuclear power plant by about two orders of magnitude. Today, there also seems to be less emphasis

on concerns about civil liberties than there was during the mid-1970's.

Transportation safety is a major concern primarily at the local level, but the Environmental Policy Institute and the Sierra Club have been conducting public education efforts and monitoring federal programs. During the 1980's there is an expectation that the safety of transporting nuclear spent fuel will be seen in the news often.

2. The Economic Issue

In terms of damage to the future of the nuclear power industry and the level of effort of the national groups, the economics of nuclear power is probably the top issue. Many opponents, in fact, believe that nuclear power is so uneconomical that there is no prospect that the industry will revive from its current stagnation without new, massive federal subsidies. The national groups surveyed uniformly believe that they have conclusively won the argument that there are cheaper alternatives.

Some economic issues are still being fought at the national level. National groups are working to eliminate federal economic support and subsidies for commercial nuclear power. The most prominent issue here is the proposed Clinch River Breeder Reactor (CRBR) in Tennessee. Although many other arguments are raised against this project, the most politically effective one is its high cost. A broad coalition, the Taxpayers' Coalition Against Clinch River, which includes fiscal conservatives, has been formed to push the case against the CRBR before Congress. The groups expect victory during the current session of Congress, benefitting

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from the need to reduce the budget deficit and the general leanings of the new members of the U.S. House of Representatives.

The second national economic issue is the indirect subsidy provided to the commercial nuclear power industry by the Price-Anderson Act, which sets limits on the liability of utilities and equipment suppliers for damages in the event of a major nuclear accident. The groups influencing public opinion against nuclear power argue that companies building, owning and operating nuclear facilities should take full financial responsibility for damages caused by accidents releasing radioactivity. "If the industry won't take full financial responsibility, why should we believe their statements that no catastrophic accident is likely to occur?" This issue is, therefore, one of credibility and reactor safety, as well as economics.

At the state level the principal function of the national organizations is to provide information and assistance to local groups. The Environmental Action Foundation, for instance, provides studies showing that nuclear power plants are uneconomic to groups appearing before state public utility commissions. Occasionally, national organizations will conduct economic studies on a specific plant and provide an expert witness. The energy project director for Friends of the Earth, for example, has testified on nuclear economics in proceedings on specific nuclear power plants. In some cases the intervenors argue that even partially completed nuclear power plants are uneconomical in comparison to conservation and generation alternatives.

At the local level, a major argument currently seems to be over the timing and distribution of the costs of building nuclear power plants. Local groups usually oppose putting the costs of constructing plants into the rate base prior to the generation of electricity. Also, local groups attempt to force stockholders, rather than customers, to pay for cost overruns. The discussion of who pays what costs of particular nuclear power plants takes place in the context of the current national debate about the costs of all types of projects supported with public monies, and in the context of deep public concern about the rising costs of energy services. The opponents of nuclear power, therefore, are able to capitalize on a broader national concern.

3. Radioactive Wastes

The problem of radioactive waste disposal is a deep concern of the national groups. Their members and grass roots organizations frequently ask questions about this issue and wonder how it will ever be solved. Staff are skeptical that the technology exists to contain the wastes safely for thousands of years, and, even if it did, they doubt that the U.S. Department of Energy would implement it properly. For many people, the lack of a national repository for high-level radioactive wastes and problems with some of the existing low-level waste burial sites are persuasive political arguments against nuclear power.

Some technical staff believe that scientists and technologists could design an adequate repository for high-level wastes. But they do not yet have confidence that the federal program will lead to selection of safe sites and repository

designs.

Passage of the Nuclear Waste Policy Act of 1982 is unlikely to diminish concerns about high-level wastes. In the near future, in fact, attempts to implement the Act may exacerbate doubts and fears about the federal program, because the U.S. Department of Energy will have great difficulty in meeting the numerous deadlines in the Act. In attempting to meet those deadlines, the opportunities for citizen and state involvement in analysis and decisionmaking will probably be very restricted. Since state and public participation in consideration of alternatives for managing wastes, and for siting, building and operating repositories is a major concern of the national groups, there may be acerbic debates during the initial implementation of the Act. Lawsuits and political action by the national groups will probably be undertaken.

The low-level waste disposal problem is not a major issue for the national groups. Concerns about low-level waste disposal are raised primarily in regional, state and local contexts by non-national groups. Some of the organizations surveyed for this report, however, do provide information and assistance to local organizations. For instance, the Sierra Club Foundation provides financial support to the Radioactive Waste Campaign which is focused primarily on low-level waste disposal in the Northeast.

4. Nuclear Proliferation

The national organizations agree with experts, such as former nuclear bomb designer Ted Taylor, who are convinced that the spread of nuclear power reactors to non-nuclear weapons states

will significantly increase the chances that a nuclear explosive will be used against people. By increasing the number of people knowledgeable and experienced with nuclear technology, the national groups believe there is a greater likelihood that a country or subnational organization seeking to achieve a political goal, or entity faced by a overwhelming military threat will turn the nuclear plowshares into weapons of mass destruction. The groups are also concerned that countries with large commercial nuclear power industries could make many more nuclear bombs, than countries that had to rely on small reactors to produce fissile material. The groups, thus, oppose progress toward the "plutonium economy," such as the Barnwell reprocessing plant and breeder reactors.

5. Reactor Safety

The possibility of a catastrophic release of radioactivity from an operating power reactor is seen by the groups surveyed as the greatest immediate threat to the public health and environment. Consequently, at least until recently, concern about reactor safety was the biggest nuclear issue in terms of the national groups' efforts. Although there seems to be no significant reduction in the groups' assessments of the threat of reactor accidents, less effort is now spent on the reactor safety issue than in the mid-1970's. This downturn probably reflects the decrease in licensing forums following the reduction in orders and increase in cancellations of nuclear power plants by utilities. As long as this moratorium on nuclear power plant orders is maintained, reactor safety will stay in the background.

6. Sociopolitical Effects

There are at least two distinct sociopolitical issues of concern to the groups surveyed. First, in the attempt to safeguard nuclear facilities from potential saboteurs and terrorists, the government and nuclear industry may infringe on civil liberties. The police, in order to be informed about individuals or groups who might damage facilities for political reasons, might monitor employees and surveille (including infiltrate) "anti-nuclear" organizations.

Second, there is the concern that nuclear power fosters technological elitism, removing the average citizen from participation in decisionmaking. This tendency is contrary to the often strongly held views of the national organizations that there should be more public participation on matters affecting everyone's life, not less.

7. Low-Level Radiation

There is substantial concern by a few of those surveyed that low-level radiation is more injurious to human health than is stated by experts relied upon by government and industry. Thus, some individuals surveyed were concerned that the routine releases of radioactivity into the general environment by nuclear facilities could raise cancer rates unacceptably.

8. Transportation Accidents

The national groups have done relatively little on transportation safety issues to date. Because the safety of spent fuel and high-level waste shipments is a serious concern at the grass roots level, however, the national staffs are responsive to

members' and citizens' inquiries by providing information.

FOOTNOTES TO SECTION C

¹In the 1960's and early 1970's environmental groups were also concerned about the thermal pollution caused by the discharge of cooling water from nuclear power plants into rivers and lakes. This concern has diminished substantially since cooling towers were required by the federal government. None of the groups surveyed indicated they were still concerned about thermal pollution from nuclear power plants.

D. Current Activities and Level of Effort Devoted Specifically to Nuclear Power Issues by Major National Groups

1. Introduction

The major national groups engage in a variety of activities that influence public opinion against commercial nuclear power. The principal activities can be placed in the five categories identified below. Underneath each category is a list of the organizations for which that type of activity has recently been important concerning nuclear power.¹

1. Legal (filing lawsuits and participating in formal rulemaking proceedings).

- o Environmental Defense Fund
- o Friends of the Earth
- o National Audubon Society
- o Natural Resources Defense Council
- o Sierra Club
- o Union of Concerned Scientists

2. Lobbying (before federal administrative agencies and Congress, and grass roots lobbying).

- o Environmental Action
- o Environmental Policy Institute
- o Friends of the Earth
- o Sierra Club
- o Union of Concerned Scientists

3. Informational and Educational (publishing newsletters, holding seminars and conferences, grass roots networking).

- o Critical Mass Energy Project
- o Environmental Action
- o Environmental Policy Institute
- o Friends of the Earth
- o Nuclear Information and Resources Service
- o Safe Energy Communication Council
- o Sierra Club
- o Union of Concerned Scientists

4. Research and Study (developing new analyses that can be published or used by others in opposing nuclear power).

- o Environmental Action
- o Environmental Defense Fund
- o Friends of the Earth
- o National Audubon Society
- o Natural Resources Defense Council
- o Union of Concerned Scientists

5. Political Action (supporting ballot initiatives and candidates).

- o Environmental Action
- o Friends of the Earth
- o Sierra Club

Except perhaps for the Safe Energy Communication Council, each group participates to a degree in all of the activities, however. The predominate type of activity for each organization varies over time as the groups respond to external events. For instance, a major activity in 1982 for almost all of the groups was lobbying on the Nuclear Waste Policy Act, which was signed into law by President Reagan in January, 1983. The Safe Energy Communication Council only works with the news media, and with other groups that contact news outlets, and appears not to be involved in other activities. The other groups usually publicize their efforts in newsletters to members and interested persons, as well as through press releases and media events.

During the 1980-82 time period and in relation to other issues they addressed and in comparison to expenditures by organizations promoting nuclear power, the financial and staff resources of the national organizations that were devoted to nuclear power issues were small. The smallness of the total effort reflects the facts that the organizations themselves are

not large and that the bigger national environmental organizations must address many diverse issues simultaneously. The lack of major expenditures by national groups in opposing nuclear power probably also reflects the groups' view that there will be no more growth in the nuclear power industry because nuclear power plants are uneconomical. Annual reports and interviews suggest that the recent yearly, total direct expenditure on nuclear power issues by the surveyed national groups is about \$4 million.²

2. Specific Activities (1980-82)

The activities listed below are more illustrative than comprehensive. To describe all of the efforts on nuclear power by the eleven groups would require a much longer report than this one.

a. Critical Mass Energy Project/Public Citizen, Inc.

The Critical Mass Energy Project works to achieve the immediate halt to all nuclear construction and the phase-out of existing plants and nuclear weapons. The Project advocates the development of renewable energy systems.

The Project publishes the monthly Critical Mass journal and numerous reports and pamphlets. Perhaps the most widely recognized publication is the Nuclear Power Safety Report that catalogs significant mishaps, worker exposure, operating performance and other statistics about plants.

The Project assists citizens and local groups obtain information against nuclear power and locate experts who might help them. The Project serves as a clearinghouse on nuclear power

issues and occasionally sponsors conferences, such as "Critical Mass '83" to exchange information about alternatives to nuclear power.

b. Environmental Action/Environmental Action Foundation

In 1982 Environmental Action's three major nuclear activities were: (1) lobbying on the federal nuclear waste bill, (2) lobbying against the Clinch River Breeder Reactor, as a member of the Taxpayers' Coalition, and (3) fighting imposition of the costs of decontaminating the Three Mile Island (Unit 2) nuclear plant on general ratepayers and taxpayers.

The Environmental Action Foundation's Energy Project sponsored a series of state and regional conferences on nuclear waste transportation, nuclear plant licensing issues, and construction-work-in-progress (CWIP) charges. The Foundation continued to function as a national clearinghouse on nuclear and alternative energy resource information. A major study was published: Power & Light: Political Strategies for the Solar Transition.

c. Environmental Defense Fund

The Environmental Defense Fund sponsors an energy program that emphasizes economics. Since 1976 the Fund has conducted studies of utility investment planning for specific nuclear power plants that show environmentally less damaging alternatives to proposed nuclear power plants do not cost more money. In 1981, the utility investment project began focusing on nuclear power plants already under construction.

The Environmental Defense Fund intervened in the Public Service Commission hearings on the Nine Mile Point Unit 2 nuclear power plant near Oswego, New York, presenting evidence that developing alternative energy resources might be cheaper than completing the plant even though over \$1 billion had already been spent on it. In response, the New York State Public Service Commission has convened a separate proceeding to consider how to bring about such alternative investment. The Environmental Defense Fund is participating in this new proceeding.

d. Environmental Policy Institute

The Environmental Policy Institute sponsors a Nuclear Power and Weapons Project that is intended "to reduce dependance on nuclear power and to seek cuts in the production of nuclear weapons and to end nuclear weapons testing." The Project conducts work in five areas, concerning (1) transportation of nuclear materials, (2) nuclear waste disposal, (3) nuclear industry liability and insurance, (4) health effects of radiation, and (5) proliferation of nuclear weapons and impacts of weapons testing. In all five areas, the Institute provides information to citizens and local organizations and it monitors implementation of federal programs.

A major issue addressed in 1982 was passage of the Nuclear Waste Policy Act. The Institute will now monitor the Department of Energy's implementation of the Act, including submitting comments on proposed standards and draft studies.

e. Friends of the Earth/Friends of the Earth
Foundation

A major Friends of the Earth activity was lobbying against the Clinch River Breeder Reactor, founding the Taxpayers' Coalition Against the Clinch River Breeder Reactor, and lobbying on federal nuclear waste legislation. Friends of the Earth also led efforts to oppose the siting of a high-level radioactive repository near the Canyon Lands National Park in Utah. Additionally, Friends of the Earth continued its interventions in the licensing hearings for the Shoreham (New York) and San Onofre (California) nuclear power plants, and in the relicensing proceeding for the test reactor at Vallecitos, California.

Amory and Hunter Lovins wrote a special issue of Not Man Apart, the Friends of the Earth periodical, called, "Nuclear Power and Nuclear Bombs," which was later published as the book Energy War. Friends of the Earth also completed a major study on the vulnerability of the U.S. energy system for the Federal Emergency Management Administration and the President's Council on Environmental Quality. This study has been published as a book, Brittle Power, by Amory and Hunter Lovins.

Friends of the Earth Foundation continued its International Project for Soft Energy Paths, which provides information and analysis for reducing reliance on fossil fuels and nuclear power by using energy more efficiently and by increasing the use of small scale renewable resources while strengthening the economy, protecting the environment, and enhancing national security. The Project's periodical, Soft Energy Notes, contains articles by authors in many countries and it has a broad international circulation.

The Foundation also provided support to Friends of the Earth for (1) the three reactor licensing interventions, (2) a review of the new transportation rules for radioactive materials, and (3) monitoring the federal search for nuclear waste repositories.

f. National Audubon Society

Nuclear power issues probably do not account for more than about one or two percent of the National Audubon Society's annual budget. Most of that expenditure is used to respond to member's inquiries and requests for assistance. The national staff, however, did submit testimony in the Indian Point nuclear power plant licensing proceeding and in Congress in 1982. The National Audubon Society also supported the efforts of other national groups that were participating in efforts to oppose aspects of the Administration's nuclear power program, and to lobby on nuclear waste legislation.

g. Natural Resources Defense Council, Inc.

The Natural Resources Defense Council's principal effort in the area of nuclear power recently has been to oppose the Clinch River Breeder Reactor (1) in regulatory proceedings before the Nuclear Regulatory Commission, (2) in comments on the environmental impact statement required by the National Environmental Policy Act, and (3) by participating in the Taxpayers' Coalition Against CRBR, which opposes further funding of the project. The Natural Resources Defense Council also undertook several activities to reduce the spread of nuclear weapons that might be caused by the use of commercial nuclear power technology abroad.

In terms of expenditures, nuclear power issues rank only seventh or eighth in the Natural Resources Defense Council's budget. Total funding for nuclear activities accounts for only a few percent of the total budget.

h. Nuclear Information and Resource Service

To supplement its basic information and referral service, the Nuclear Information and Resource Service started the following new programs: (1) the "Don't Waste America" Project, which is intended to stimulate citizen involvement in waste disposal decisions and to prevent the Department of Energy from moving too quickly to site a repository; (2) the International Project, which provides information to groups in other countries opposing nuclear weapons and nuclear power; (3) Legislative and Regulatory Alerts, which notify active citizen groups and experts of developments requiring their attention (e.g., nuclear waste policy legislation and proposed exemption of the Clinch River Breeder Reactor from licensing); (4) the Emergency Planning Project, which addresses the issue of inadequate emergency planning near nuclear power plants (e.g., Zion near Chicago, and Indian Point and Shoreham near New York City); (5) Safety Versus Economics: A Project on Steam Generators and Reactor Vessel Rupture, which is concerned with unresolved generic safety questions; and (6) development of Safe Energy Model Legislation.

i. Safe Energy Communication Council

The Safe Energy Communication Council is a new coalition formed to counter pro-nuclear advertising and publicity by the Committee for Energy Awareness. (See section B.2.j. above.)

j. Sierra Club/Sierra Club Committee on Political Education/Sierra Club Foundation/Sierra Club Legal Defense Fund

The Sierra Club's Board of Directors first voted to oppose construction of more nuclear power plants in 1974, reflecting its concern about safety, waste disposal, and nuclear weapons proliferation. The accident at the Three Mile Island (Unit 2) nuclear power plant resulted in the following stronger position in 1979, which is still the official policy:

- o The events at the Three Mile Island Nuclear Plant reaffirm our concern about the lack of safety of nuclear plants and demonstrates that the possibility of human error dooms the nuclear fuel cycle to unacceptable risks.
- o We oppose the licensing, construction, and operation of new nuclear fission plants.
- o We support the systematic reduction of society's dependence on nuclear fission as a source of electric power by a phased closure and decommissioning of operating commercial electric power reactors.
- o Meanwhile, the power, temperature, and heat transfer rates in large plants should be reduced when necessary to increase plant safety margins.

The Sierra Club's group of organizations spends one percent or less of its combined annual expenditures on nuclear power issues. Recently, the Sierra Club lobbied on federal nuclear waste legislation and against funding for the Clinch River Breeder Reactor.

A relatively large project endorsed by the Sierra Club and supported by the Foundation is the Radioactive Waste Campaign run by the Buffalo Chapter. The Radioactive Waste Campaign focuses primarily on the issue of low-level radioactive waste disposal in

the Northeast, but it also addresses questions concerning the transportation of radioactive materials (particularly spent fuel) and the existing high-level radioactive wastes at West Valley, New York.

The Legal Defense Fund has filed a lawsuit concerning uranium mill tailings disposal. The purpose of the lawsuit is to force the federal government to accelerate its program to clean up abandoned mill tailings piles in the Rocky Mountains, Oregon and Pennsylvania.

k. Union of Concerned Scientists

The Union of Concerned Scientists testified in hearings before the Nuclear Regulatory Commission on the request to resume operation of the Three Mile island Unit 1 nuclear power plant, charging that inadequate, quick-fix solutions to serious problems were being proposed. The staff also advised the Environmental Protection Agency and the Congress on issues related to the clean-up of the Three Mile Island Unit 2 plant. The Union of Concerned Scientists also was active concerning design and operating flaws and emergency preparedness plans for the Indian Point nuclear power plant.

The staff also (1) filed comments concerning the need to upgrade safety components at operating reactors, (2) provided advice on the Philippine Nuclear Power Project, (3) submitted comments to the Food and Drug Administration supporting predistribution of potassium iodide to the population around nuclear power plants, and (4) submitted comments to the Nuclear Regulatory Commission on a variety of procedural issues.

Concerning high-level radioactive waste, the Union of Concerned Scientists has (1) opposed increased storage of spent fuel at reactor sites, and (2) filed comments on regulations for disposal, urging a methodical, cautious approach.

The staff also conducted several technical and economic analyses and published materials calling for more emphasis on conservation of energy and renewable energy resources.

About sixty percent of the annual budget of the Union of Concerned Scientists is devoted to nuclear safety and non-nuclear energy alternatives. (The remaining portion is spent on arms control issues.)

FOOTNOTES TO SECTION D

¹Again, a legally important distinction has not been made between closely related organizations, such as Friends of the Earth and Friends of the Earth Foundation. Friends of the Earth and Friends of the Earth Foundation although often addressing the same issues, use strictly different procedures and sponsor different types of activities, reflecting their tax status. In this list, however, they are counted as one group for the author's convenience.

²This figure is a rough estimation based principally on the annual expenditures listed in annual reports during the 1980-83 time period.

E. Trends and Future Possible Activities Concerning Nuclear Power by the Major National Groups

In the early 1960's there was substantial support for nuclear power development by environmentalists. As environmental organizations grew during the late 1960's and beginning 1970's and as they became more active in national energy policymaking, however, concern about radioactive waste disposal, safety and nuclear proliferation developed. Over the decade of the 1970's opposition to nuclear power became stronger. By 1980 the major environmental organizations either formally adopted positions calling for the phase-out of commercial nuclear power plants, or conducted activities consistent with such a position. Since the early 1970's new groups narrowly focused on energy issues were formed to oppose nuclear power plants even more vigorously than the broader environmental organizations.

Those concerned about nuclear power issues worked with and within other citizen movements and became a part of the activism of the 1960's and 1970's. The organizations opposed to nuclear power development often found allies among those who were concerned about environmental pollution, who distrusted government and corporations, and who supported women's rights. Currently, these organizations are working with those in nuclear arms control issues.

Although the environmental organizations surveyed for this report are still putting significant effort into nuclear power

issues, over the past few years there seems to be diminution in the level directed to energy issues in general and nuclear energy concerns in particular. This trend will probably continue as long as electrical energy use does not grow rapidly and utilities do not start ordering nuclear power plants in large numbers. If these conditions change, however, the major national groups probably would react by increasing their efforts to oppose the increase in nuclear power plant orders.

During the past several years both the environmental and energy groups have shifted the emphasis of their work from opposition to nuclear power plants to support of energy conservation and renewable resources as alternatives to nuclear power and oil. The national groups have prepared or contributed to several detailed, technical studies that conclude that more nuclear power plants are not needed, because more economical and environmentally benign alternatives exist. Promoting these cost-effective alternatives is likely to continue as the predominant energy activity for most of these groups.

The national groups are increasing their efforts on arms control and nuclear weapons issues. Some of the groups approach this issue from the perspective that nuclear war would be the ultimate environmental catastrophe. Others seem to be turning to aspects of nuclear weapons issues as a natural evolution of their work on the possibility of proliferation of nuclear weapons via commercial nuclear power. Involvement of the national groups in the growing anti-nuclear weapons movement will likely strengthen them and help maintain their capability to oppose commercial

nuclear power development in the future.

Local organizations, however, may increase their opposition in response to sitings and proposed operation of new nuclear power plants. Local groups, moreover, will be active in raising concerns about high-level and low-level radioactive waste disposal sites and transportation of radioactive materials. National organizations will continue to provide these local groups with information and assistance on these issues.

Economic issues concerning existing nuclear power plants will also be a major focus of the local groups and the national organizations (e.g., Environmental Action) that provide assistance to them. The local groups will continue to seek ways to avoid payment for construction-work-in-progress (CWIP), cost overruns, and decontamination and decommissioning of the Three Mile Island Unit 2 nuclear power plant. Emergency preparedness and evacuation plans will continue to be a significant area of debate and controversy for the next few years, too.

F. Conclusions and Observations

The staff members interviewed for this report repeatedly stated their belief that the commercial nuclear power industry is on the decline and that it will not be rejuvenated in the foreseeable future. They hold that nuclear power has been shown to be unnecessary and uneconomical in comparison to alternatives that are more desirable from environmental and social perspectives. Thus, they give the impression that more commercial nuclear power would be unacceptable, even if major reactor safety concerns were satisfactorily resolved. They can visualize no changes that would make nuclear power more desirable than energy efficiency measures and appropriate renewable resources. This strong belief, together with the sweeping range of health and safety concerns with nuclear power, suggests that there is no set of reforms that would make growth of nuclear power acceptable to the major national groups. The premise that nuclear power is "dead" is so firmly held that several interviewees expressed astonishment that the Office of Technology Assessment would bother conducting a study on "saving nuclear power."

There are, however, changes in the nuclear power program that would increase the level of acceptance of existing power plants and that would also diminish resistance to new ones by the national groups and the public they represent. First, several actions could be taken to alleviate concerns about the proliferation of nuclear weapons. Specifically:

- o The Clinch River Breeder Reactor should be cancelled;
- o There should be no further attempts to revive

commercial spent fuel reprocessing in the United States and abroad;

- o Spent fuel derived from fuel prepared in the United States should be returned intact to the United States.

Second, state governments and the public should be allowed full and effective participation in the review of alternatives for managing and disposing of high-level radioactive wastes.

Achieving such participation in the implementation of the complex Nuclear Waste Policy Act of 1982 will be difficult, requiring more resources than has been characteristic of the federal waste management program in the past. Among other things, all reports, including contractor reports, developed by the federal program should be made available for scrutiny as soon as they are completed. Adequate time must be provided for states and the public to analyze major documents and proposed plans. Safety, not politics or convenience, must in fact be and must seem to be the foremost concern of policymakers. Sites for repositories should not be pushed principally because they are located on existing federal land, for instance. A technically conservative approach to locating, designing, constructing and operating geologic repositories should be adopted, in order to develop public confidence in the federal program.

With regard to reactor safety, the groups put most of their emphasis on the need for procedural changes. The national groups want more open and flexible licensing procedures so that citizens can easily and effectively participate. They do not want the outcome of proceedings predetermined as they now appear to be. They want workable evacuation plans, and unresolved safety

questions answered by experts. And, they want all liability limits for the nuclear industry removed. They do not want "licensing reform," as suggested by the Reagan Administration and the nuclear industry, that has as its principal purpose speeding up the process by restricting opportunities for intervenors to raise important safety issues.

There does not now appear to be a set of detailed engineering improvements that would entirely alleviate the groups' safety concerns with existing light water reactors. No group has voiced a strong preference for other reactor designs, e.g., High Temperature Gas Reactor, Heavy Water Reactor, either.

Nonetheless, there have been suggestions that technical improvements in light water reactor safety can and should be made. Because these recommendations have not been seriously scrutinized, either by the groups or apparently by the industry, their impact on the groups' views concerning reactor safety is unknown. Perhaps a national forum to consider changes that would increase safety could help resolve some concerns.

Several of the people interviewed approved of a new requirement to have utilities independently certified or licensed as competent to build and operate nuclear power plants. But no one wanted only the federal government to build and operate future nuclear power plants.

The major national groups express substantial distrust of those in government and industry responsible for commercial nuclear power. A long period of improved relations would be necessary to overcome this strong distrust. There is substantial

diversity on this point among the organizations surveyed for this report, however. Some may be willing to engage in serious dialogue with nuclear advocates, if they felt that there were prospects for obtaining industry's support for improvements in safety systems.

The groups also express great technological pessimism. Their feeling is that nuclear power is an "unforgiving" technology. They see that one serious design or operating mistake could be catastrophic. Although this pessimism extends to technologies other than nuclear, the groups believe that alternative technologies are simpler, and therefore less likely to go "wrong," and, most importantly, that the alternative technologies are more "forgiving," i.e., not as harmful when they break down. The collapse of a wind conversion machine, or even a whole field of them, for instance, would not cause significant harm in comparison to the release of part of the inventory of radioactivity in an operating nuclear power reactor. A long period free of serious reactor incidents, together with an industry program to improve power plant performance might significantly reduce this pessimism, however.

In sum, there are policies available to reduce the national groups' level of activity in opposition to nuclear power, but there appears to be no set of changes that would make commercial nuclear power entirely acceptable to them and, by extension, the public they represent. If nuclear power development begins to pick-up, regardless of the details of the technology, there probably would be a corresponding increase in opposition by the

major national groups influencing public opinion.

APPENDIX I

List of Major National Groups
Influencing Public Opinion Against Nuclear Power
Identified for this Survey
(addresses are for headquarters)

- | | |
|---|---|
| 1. Critical Mass Energy Project
P.O. Box 1538
Washington, DC 20013 | 7. Natural Resources Defense Council
122 East 42nd Street
New York, NY 10168 |
| 2. Environmental Action, Inc.
Room 731
1346 Connecticut Ave., N.W.
Washington, DC 20036 | 8. Nuclear Information and Resource Service
1536 16th St., N.W.
Washington, DC 20036 |
| Environmental Action Foundation, Inc.
724 Dupont Circle Bldg.
Washington, DC 20036 | 9. Safe Energy Communication Council
1609 Connecticut Ave., N.W.
Suite 4B
Washington, DC 20009 |
| 3. Environmental Defense Fund, Inc.
444 Park Avenue South
New York, NY 10016 | 10. Sierra Club/Sierra Club Committee on Political Education/Sierra Club Foundation
530 Bush Street
San Francisco, CA 94108 |
| 4. Environmental Policy Institute
317 Pennsylvania Ave., S.E.
Washington, DC 20003 | Sierra Club Legal Defense Fund
2044 Fillmore Street
San Francisco, CA 94115 |
| 5. Friends of the Earth/Friends of the Earth Foundation
1045 Sansome Street
San Francisco, CA 94111 | 11. Union of Concerned Scientists
126 Church Street
Cambridge, MA 02238 |
| 6. National Audubon Society
950 Third Avenue
New York, NY 10022 | |

APPENDIX II

List of Interviews Conducted for this Survey

<u>DATE(1983)</u>	<u>INDIVIDUAL/AFFILIATION/LOCATION</u>
January 11 (in person)	Jan Beyea/National Audubon Society/New York City
January 14 (in person)	Thomas Cochran/Natural Resources Defense Council/Washington, DC
January 14 (in person)	David Berick/Environmental Policy Institute/ Washington, DC
January 14 (in person)	Brooks Yeager/Sierra Club/Washington, DC
January 18 (in person)	Isabel Weber/League of Women Voters Educational Fund/Washington, DC
January 20 (by telephone)	Eric Van Loon/Union of Concerned Scientists Cambridge, MA
January 20 (by telephone)	Joanna Hoelscher/Citizens for a Better Environment/Chicago, IL
January 21 (by telephone)	Scott Denman/Safe Energy Communication Council/ Washington, DC
January 25 (in person)	John Adams/Natural Resources Defense Council/ New York City
January 26 (by telephone)	Gene Coan/Sierra Club/San Francisco, CA
January 26 (by telephone)	Sheila Mayberry/Critical Mass Energy Project/ Washington, DC
January 26 (by telephone)	Alden Meyer/Environmental Action Foundation/ Washington, DC
January 26 (by telephone)	Ruth Kaplan/Environmental Action (Sierra Club)/ Washington, DC
January 27 (by telephone)	Rafe Pomerance/Friends of the Earth/Washington, DC

January 27 (by telephone)	Lorna Salzman/Friends of the Earth/New York City
January 27 (by telephone)	Mina Hamilton/Radioactive Waste Campaign (Sierra Club)/Buffalo, NY
January 27 (by telephone)	Jim Harding/Friends of the Earth/San Francisco, CA
January 27 (by telephone)	Renee Parsons/Friends of the Earth/Washington, DC
February 1 (by telephone)	Jeffrey Knight/Friends of the Earth, San Francisco, CA
February 3 (by telephone)	Janet Lowenthal/National Information and Resource Service/Washington, DC
February 14 (in person)	Michael Oppenheimer/Environmental Defense Fund/ New York City

SCIENCE CONCEPTS

ACTIVITIES OF GROUPS WHICH INFLUENCE
PUBLIC OPINION IN FAVOR OF NUCLEAR POWER

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ACTIVITIES OF GROUPS WHICH INFLUENCE
PUBLIC OPINION IN FAVOR OF NUCLEAR POWER

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SECTION 1

INTRODUCTION

1.1 PURPOSE

This report presents the authors' identification and assessment of the activities of groups which influence public opinion in favor of commercial nuclear energy. This report was prepared by Science Concepts, Vienna, Virginia as requested by the Congressional Office of Technology Assessment (OTA) under contract 333-3920.0.

This report makes no attempt to identify or discuss every organization in the United States that directly or indirectly impacts public opinion regarding nuclear energy in a favorable way. Rather, it is intended to identify major or national players in the on-going "nuclear debate", to provide basic information on their activities, and to assess the problems and effectiveness of the activities. The assessment of the effectiveness and importance of issues is based on the opinions of principals of those organizations as expressed primarily in telephone interviews; and secondarily, from the public literature of those organizations. The authors recognize that the subjective evaluations contained in the discussions and summary may not be fully documented by the information

contained in this report, but are supported by the authors' experience in the public debate surrounding commercial nuclear energy. (In that regard, it should be noted that the authors' have both worked for and with organizations that influence public opinion in favor of nuclear power.)

1.2 REPORT FORMAT

This report focuses on national or major players whose activities either intentionally or unintentionally effect public opinion in favor of nuclear power. The players have been split into three broad categories: the industry, professional societies, and citizen or non-aligned groups. Each of the organizations have been contacted to provide information on public relations or public education activities that directly or indirectly impact public opinion (representative samples of this information are included in the attachments). For each of these organizations, senior individuals were interviewed and their comments and judgements about their respective organizations were incorporated. The nature, make-up, activities and goals of each of these organizations are included in sections 2.0, 3.0 and 4.0. A general summary of the report is contained in section 1.5.

1.3 FACTORS INFLUENCING PUBLIC OPINION

The consensus among those involved in the "nuclear debate" is that the future of commercial nuclear energy will be significantly determined by the public's opinion of both the importance and danger of this technology. The high level of public interest in nuclear power demonstrated by the experience of participants in the public debate as well as by the evidence contained in a multitude of surveys and polls. (A full accounting of the polls and surveys reflecting public attitudes on nuclear energy is contained in the associated OTA staff study "Public Attitudes Towards Nuclear Power," M. Hilton.)

The public's concern with commercial nuclear energy and the factors that influence its opinions are related to a number of broader issues: the growth of environmental awareness; a popular interest in science and technology; a perception of increasing technological risk in the world at large; a belief in a cancer epidemic; and an erosion of confidence in institutions. A thorough examination of each of these issues goes far beyond the scope of this paper; however, for our purposes it is important to briefly describe their general nature.

i) The growth of environmental awareness

The evolution of the environmental movement and the public's interest in environmental issues has been extensively discussed and documented. It underlies much of the recent public concern over industrial activities popularly perceived as presenting new and ill-defined risks. Probably the major portion of the debate regarding commercial nuclear energy revolves around the contention of nuclear critics that the environmental penalties are too great or too unpredictable, and the pro-nuclear community's assertion that the environmental costs are both low and manageable.

The evolution of grassroots activism and special interest lobbying on the part of citizen groups occurred during the same period that the environmental movement took hold and is not totally unrelated to it. Indeed, the anti-nuclear movement grew out of the environmental movement. These twin developments have had powerful ramifications for utilities trying to site nuclear power plants (and increasingly other facilities as well). Citizens acting in concert to oppose nuclear power on principle or simply because the plant is "in my backyard" have made the issue a cause celebre in several instances.

The net result of this strong degree of public interest has been to substantially change both the manner and climate in which governments and government controlled or regulated industries can make decisions. This has obvious implications

for commercial nuclear energy, an enterprise that has from its inception involved decisions made by large institutions traditionally remote from the average man-in-the-street.

ii) Public interest in science & nuclear energy

As popular interest in science and technology increased over recent years, so too has the public's concern with nuclear technology. This general interest in science has led to a minor flood of special interest magazines on science (Omni, Discover, Science 83, Technology, High Technology, etc.) and new television series and programs (eg., Walter Cronkite's Universe, Omni, Cosmos, Life on Earth, etc.). While a number of these publications and shows have been cancelled* -- probably in large part to an oversaturation of the marketplace during the early stages of the science boom -- we still have a far greater number of popular science outlets for general public consumption than at any time in recent history. And, at one time or another, each of these has inevitably addressed the subject of commercial nuclear energy.

The existence of new and receptive outlets for public "education" on science matters generally, and nuclear topics in particular, provides a clear opportunity for participants in

* "Whatever Happened to the Science Media Boom?", F. Jerome, Technology Review, January 1983

the nuclear debate to exert their influence on public opinion. However, there is a serious question as to whether the general public is truly interested in basic technical information on nuclear technology or merely its sensationalized "gee-whiz" aspects. This question is partly answered by a number of studies that show the current level of public education and knowledge of science and math in general is abysmal.

A "Star Wars" view of science and technology does not constitute a receptive climate for public education efforts on the esoteric issues surrounding nuclear technology. The nature of many popular TV shows on science subjects and the majority of articles in popular science magazines further support the thesis that people are interested in science as entertainment. A disturbing example of this interest in gee-whiz and pseudo-science is evident in one survey that found one-fifth of respondents saying that they frequently change their daily plans on the basis of their horoscopes -- and that another 65 percent do so occasionally.*

This situation has significant implications for the entrenched parties in the nuclear debate. For nuclear critics, it is probably an advantage; the public seems to have a morbid fascination with catastrophe, and the implicit or explicit

* "Science and the Successful Society," L. John Martin,
Public Opinion, June/July 1981

message of much popular nuclear criticism (at the very least the manner in which it is characterized in the popular press) is one of impending, or insidious disaster. Raising the specter of catastrophe is one of the entertainment industry's best sources of revenue (eg., "Earthquake," "Towering Inferno," "The China Syndrome"). The pro-nuclear community does not have this inherent 'advantage' as it seeks to put "perspective" on technical and economic issues or provide basic information to educate the public.

Nonetheless, where there is both concern and an interest in science, there is a special interest in nuclear energy. According to a National Science Foundation-sponsored survey, twice as many people are interested in learning more about and discussing nuclear energy than the space program.* This level of interest would justify the desire of virtually all participants in the debate to continue to address the public on nuclear topics.

It is apparent that those organizations described in this OTA paper regard the public as interested and willing to learn more about the subject of nuclear energy. Both the statements of staff interviewed for this paper and the assumptions in their organizational activities reveal a recognition of public concerns about nuclear power.

* "Science and the Successful Society," L. John Martin, Public Opinion, June/July 1981

iii) The perception of increasing risk

There appears to be a general notion among the American public that one side-effect of modern technology is increased personal risk, a perception which manifests itself in a trend towards risk aversion. This phenomenon is apparent in a dramatic nation-wide increase in legal actions designed to protect public safety.* While heightened awareness of the need to ensure public health and safety has produced many necessary changes in a variety of technological systems, it has unfortunately complicated the task of separating genuine from trivial concerns and obscured the demonstrable fact that science and technology have improved our overall quality of life.

Survey results show that there has been a significant decline in the public's belief that the benefits of science and technology outweigh its harmful aspects.** (Some observers believe that a large part of this increasing concern about the negative effects arose from the discovery of nuclear fission.) One particularly exhaustive survey on this issue clearly showed that "there is a broad consensus that Americans face more risk

* "The Mindless Pursuit of Safety," W. Guzzardi Jr.,
Fortune, April 9, 1979

** "Public Attitude Toward Science Is Yes, But...",
Science, 15 January 1982

today than they did 20 years ago."* Without debating specifics on this issue, it is possible to observe from the statistics in the Surgeon General's Report** that this is simply not true.

It can be argued that public awareness of the possible risks associated with science and technology is ultimately beneficial. However, these attitudes also serve to skew the climate for popular debate over many aspects of technology including the risks and benefits of commercial nuclear energy.

iv) Belief in a cancer epidemic

There appears to be a widespread belief that cancer has become an epidemic disease. This belief manifests itself both in popular attitudes (simplistically expressed as "who cares -- everything causes cancer") and in discussions with otherwise well-informed individuals. While cancer is a disease that strikes a large number of Americans (according to the Surgeon General's Report about one in four will ultimately contract a cancer), its actual incidence adjusted for age and excluding lung cancer has been declining since 1950, and the cure rate for a large number of cancers is continually improving.

Nonetheless, a belief that we are experiencing a rising incidence of cancer because of an increased number of carcinogens in our environment has lead many to oppose

* "Risk in a complex society," conducted by Louis Harris and Associates for Marsh & McLennan

** "Healthy People," The Surgeon General's Report, 1979.

activities that could add to the risk of additional exposure to any potentially harmful agent. The fact that the ionizing radiation associated with commercial nuclear energy is perceived as being a unique carcinogen (the "you can't see it, feel it, taste it, smell it" syndrome) has contributed to much of the public antagonism toward commercial nuclear power. The cancer and ionizing radiation issue is at the heart of much pro- and anti-nuclear debate.

v) The erosion of confidence in institutions

In recent years there has been widespread discussion and general agreement that the public's confidence in its traditional institutions has significantly eroded. While there are a variety of explanations for this phenomenon, it is important for the purposes of this discussion only to note its existence and possible effects on popular attitudes toward nuclear energy.*

*(Llewellyn King, publisher of the Energy Daily, has been one of the more articulate proponents of this contention and has attributed it to a combination of factors, among them the impact on the public consciousness of some pivotal events involving our traditional institutions: the civil rights movement; the environmental movement; Vietnam war; and the Watergate affair.)

One implication of this erosion of public confidence is obvious: The commercial nuclear enterprise involves a number of the nation's largest institutions-- whether government in the form of regulators or promoters, or industry and utilities, or national laboratories. Implicit or explicit distrust of these institutions colors the public's predisposition in listening to arguments and facts presented by the two camps in the public nuclear debate. This predisposition is also evident in the attitudes of the media, which serve as the primary conduit for information coming from both sides of the nuclear debate.*)

Recognition of this institutional stigma has lead to a variety of responses on the part of the pro- and anti-nuclear camps. In the case of nuclear critics, there is continual reference to the deficiencies (sometimes legitimate of course) of those institutions overseeing the commercial nuclear enterprise, as well as examples of mistakes or alleged "cover-ups." The controversy surrounding the federal government's public rhetoric on radiation risks from the early days of atmospheric weapons testing is a particularly potent example of the "if they lied to you then why trust them now" line of reasoning. The organizational inertia of large

*Some interesting survey data supporting this contention can be found in "Media and Business Elites," R. Lichter and S. Rothman, Public Opinion, Oct/Nov 1981.

institutions, inefficiency and obfuscation provide ample opportunities for critics to condemn these organizations as inadequate and unresponsive to the public welfare. In addition, conventional institutional language, which is often vague, reinforces the view that there is more to the story. It may be difficult for the institutions involved in commercial nuclear energy to change enough to significantly alter this popular perception.

The industry's response to this perception is evident in some of the programs it has undertaken to deal with negative if not hostile public attitudes (specifics regarding some of these activities are contained in section 2.0). They have, for example, attempted to put a human face on their activities and institutions by ensuring that the press and public can identify with individuals, particularly those in a position of knowledge or influence rather than spokespeople or public relations staff.* For the same reasons, they have encouraged the public involvement of sympathetic professional, non-aligned or public interest groups as well as prominent individuals.

* See for example "Warming Up the Corporate Image," A. L. Chickering, Public Opinion, Oct/Nov 1982).

1.4 THE NATURE OF THE NUCLEAR DEBATE

"It seems to be a common defect of human minds that they tend to crave for complete certainty of belief or disbelief in anything."

R. A. Lyttleton, "The Nature of Knowledge," from The Encyclopaedia of Ignorance

Those members of the public who are motivated by a genuine desire to acquire facts about nuclear energy from the most credible sources possible face several difficulties. The most significant among them are the inability or unwillingness of many knowledgeable scientists or specialists to speak out on the issue, the way in which journalists report the news, and differences between institutional spokespeople and public advocates in their accountability to their respective organizations.

i) Scientists and engineers

Experts with special knowledge of commercial nuclear energy are seldom participants in the public debate. When they do participate, their involvement does not necessarily enhance the public's understanding. The first problem for the pro-nuclear community is a consequence of the apparent aversion of scientists and engineers to become involved in public discussions. This reluctance stems from several concerns: a simple lack of time for many individuals

with otherwise full work schedules; a reluctance to become embroiled in emotional and sometimes heated debate; a distaste for popularizing or simplifying; for academic experts, a fear of becoming implicitly affiliated with industry; and a belief that public education efforts on specific and often complex topics are futile because the public at large has been poorly educated in the fundamental sciences.

A second problem for scientists relates in part to Professor Lyttleton's observation cited at the beginning of this section. The average person wants firm, often unequivocal answers to complex questions. The scientists' tendency is to couch answers in conditional phraseology. This universal and cautious use of language by most scientists has lead at least one frustrated journalist to observe that he would like to just cut off one hand from a scientist to avoid the inevitable "on the other hand" response.

ii) The media

Studying the media has become a minor institution in itself. For the purposes of this study, it is important only to note that the natural tendency of many journalists is to seek balance when producing a story. This generally takes the form of recording statements and/or rebuttals from two parties with differing viewpoints. When it comes to nuclear energy, this practice impresses the reader with the idea that there is

a fundamental split in the expert community, while providing no additional information as to the extent to which that community at large backs one or other of the contentions. This phenomenon is by no means isolated to the nuclear debate, but has serious implications when combined with the reluctance of much of the scientific community to speak out specifically on commercial nuclear technology.

The media's distortion in presentations on nuclear power was documented by The Media Institute in its survey "Television Evening News Covers Nuclear Energy" (1979). The analysis of 10 years of prime time news stories on commercial nuclear energy revealed that about three-fourths of air time was allotted to anti-nuclear spokespeople.

iii) Accountability

There is a fundamental difference in the level of accountability demanded of various individuals who speak to the public on nuclear energy. While many nuclear critics are accountable to their peers in the anti-nuclear community and in some cases to boards of directors, the industrial component of the pro-nuclear community labors under a much more formal and restrictive form of accountability.

For industry spokespeople, there are two basic

restrictions. One arises from the very nature of the business community which tends to be conservative in its outlook and approach to issues, especially those involving the press and public. In general, business prefers to maintain a low public profile on contentious issues and thus will often discourage its representatives from engaging in public debate. This can have the effect of leaving the impression of implicit guilt regarding any accusations from an industrial critic.

The second restriction arises from the political climate surrounding the most consistently visible organizations in the nuclear community: utilities. Their legal and political accountability to state and federal agencies and regulatory bodies places significant limitations on what public actions utilities may take. Few other institutions face the same degree of public scrutiny. Aside from strictly legal considerations, utilities also have a stake in maintaining their good will with the public. Unlike ad hoc organizations, they are embedded in the community infrastructure, with officers often serving on directorships of hospitals and other charitable organizations. They are there for the duration; a misstatement or lie told today will have reverberations tomorrow. This does not ensure that public deceptions or evasions never occur, but only that the consequences are severe.

1.5 SUMMARY

"When the distant and unfamiliar and complex things are communicated to great masses of people, the truth suffers a considerable and often radical distortion. The complex is made over into the simple, the hypothetical into the dogmatic and the relative into the absolute."

Walter Lippmann, "The Public Philosophy."

Lippmann's general observation is a particularly appropriate summary of the viewpoint of players that believe that the commercial nuclear enterprise is misunderstood and necessary. A number of more specific observations can be made regarding the interests, perceptions and activities of those organizations:

- The activities of the various sectors -- industry, professional societies, non-aligned groups -- are generally only loosely and informally connected (senior members of some of the professional societies may also be employees of industries involved, for example), although some have more formal ties (eg., the CEO of one organization may sit on the board of directors of another). This loose relationship seems to be a

consequence of three factors. First, each of these three broad sectors has different priorities and is connected by-and-large only by a mutual interest in the generic importance of the commercial nuclear industry. Second, it seems to be the expectation that activities will be coordinated when necessary by the few dedicated pro-nuclear public relations organizations (AIF, CEA, ANEC). Third, few of the groups have sufficient staff to make available the time for coordinated activities.

- All the groups intend to maintain or increase their level of involvement, funding or program activities.
- While there is no universal consensus on which of the critical issues has priority, there is broad consensus on the issues themselves. The need to educate the public on "the facts" regarding nuclear energy is high on everyone's list. Specific issues almost always rise from "the issue of the day" as it is defined by the media, and too often, in the opinion of many of those involved, by nuclear energy's critics.

- Those topics currently considered to be significant by virtually all of the groups covered generally include: the importance of nuclear energy/electricity to the nation's future and economy; nuclear licensing reform; safety; and management of nuclear waste. CRBR and waste transportation appear on most but not all of these agendas.
- There is a strong sense of being at a disadvantage vis-a-vis the critics and the media, and a sense of frustration on the part of many groups in looking for means and opportunities to be heard.
- There is universal agreement on the critical audiences -- Congress, media, public -- but groups choose audiences on the basis of the original motivation for their establishment (eg., ANEC and AFNE are principally Congressional lobby groups, AIF a general public information group). For the groups with a broad public focus, audiences are most often determined by budget and staff constraints rather than the way the organization ranks the significance of the audiences

1.5.1 Industry:

○ The industry view:

--Public support is critical; the public does not recognize importance of electricity in general and nuclear energy in particular; the public tends to underrate the advantages of the first and overrate the risks of the second.

○ National public relations activity is dominated by two organizations (AIF & CEA) -- the majority of other industry and industry organizations engage in major/national public education programs only occasionally, on special issues, or in special areas (eg., Congress); The staff, budget and overall level of effort from other organizations -- ANS, SE2, AAES, NRECA, APPA, etc. -- is small in comparison, indeed small even in aggregate when compared to the two principal industry PR organizations.

○ Nationally coordinated activities (eg., responding to issues such as the so-called Sandia labs safety study, court decisions on nuclear-related topics, or the publication of a major anti-nuclear book) originating with the two principal public relations associations, the USCEA and AIF, are well-planned and generally have established substantial networks for national and international information dissemination among interested parties;

o Congressional lobbying is entirely dominated by ANEC, both through direct staff lobbying activities and through its coordination activities with other industry associations and member companies. The larger individual companies (eg., Westinghouse, Stone & Webster, Combustion Engineering, and large utilities) have their own Washington lobbyists who, while working in coordination with ANEC on national issues of common interest, are also engaged in parochial issues.

o Industry activities:

- industry views the fact that they are on the defensive rather than offensive with respect to the public debate as one of their most serious problems;

- intends to maintain or dramatically increase efforts to reach the public (the largest program increases will come from the USCEA's advertising program over the next year);

- intends to take its case to the people via advertising and major media initiatives;

- intends to broaden appeal to organizations with common interests in such areas as energy security and economic growth (eg , labor unions, minority groups, and professional societies);

- perceives nuclear waste bill as major victory but has strong trepidations about implementation.

1.5.2 Professional Societies

o Professional society view:

Energy and nuclear energy are important for nation's future, but misunderstood by public. Public's perception of the experts' opinion is very different from actual consensus of expert opinions. Public policy makers need a sound understanding of the issues.

o The primary reason specialist professional societies have been drawn to the nuclear energy debate or issues surrounding it is related to the controversy and its attendant distortion of many facts.

o Professional society activities:

-activities primarily involve studies, white papers, position papers, briefings, and seminars directed towards decision leaders in government and the press (eg., AAES energy policy paper, IEEE position on nuclear waste legislation, ANS Congressional briefings and speakers bureau);

-primarily interested in establishing a basis for sound decision-making, for establishing expert views of issues;

-those whose interests are not primarily nuclear-related (and may not even officially adopt a "pro-nuclear" posture) are

drawn primarily by desire to correct misinformation and misunderstanding of the radiation and energy/environmental issues.

1.5.3 Citizen or Non-industry groups

- Citizen of Non-industry groups view:

These groups do not have a direct commercial interest in nuclear energy but view nuclear energy as a maligned technology, and as an important component in the nation's energy future, particularly for economic growth.

- Citizen of Non-industry groups activities:

- lobbying, public position papers, formal organization positions in support of nuclear energy, studies, speeches;

- public activities are often limited to taking a position in general supporting the "prudent" use of the technology as part of the "energy mix." While this does not differ substantially from the posture of most organizations (or energy experts for that matter), these groups are primarily interested in emphasizing the generic nature of their support. These organizations often gain public visibility because the professional pro-nuclear community makes use of these non-aligned statements of support in their publications, advertising and other PR activities.

SECTION 2.0

THE INDUSTRY

Introduction

Virtually all of the commercial nuclear industry's public relations and public information activities on the national level originate with three Washington D.C. based organizations: the U.S. Committee for Energy Awareness (USCEA), the Atomic Industrial Forum (AIF) and the American Nuclear Energy Council (ANEC). AIF focuses on providing services to its members, ANEC on lobbying the Congress and the USCEA on the broad public issues and general public information.

2.1 INDUSTRY ORGANIZATIONS WITH A PRIMARY FOCUS ON NUCLEAR ENERGY

- i) U.S. Committee for Energy Awareness
- ii) Atomic Industrial Forum
- iii) American Nuclear Energy Council
- iv) Nuclear Energy Women
- v) Institute for Nuclear Power Operations
- vi) Nuclear Safety Analysis Center

i) The U.S. Committee for Energy Awareness

Effort:

USCEA's 1982 budget of \$4.2 million will become approximately \$27 million for 1983. Funding comes from industry contributions. Current staff of 10 is expected to expand to about 17 in 1983. The organization manages the majority of its programs through the use of contractors and outside specialists. USCEA is supported by a consortium of large utilities and nuclear suppliers (eg., Georgia Power, Texas Utilities, PG&E, Consumers Power, Bechtel, Commonwealth Edison, Rocky Mountain Energy, Middle South Utilities).

Purpose:

The USCEA was formed immediately following the accident at TMI as an ad-hoc organization directed by an oversight steering committee of industry executives and using "loaned executives" to coordinate and manage programs to deal with public information problems. It was incorporated as a formal and independent entity in January 1981.

The organization's stated purpose is to increase the public's understanding of the importance of electricity to maintaining a strong economy. There has been and will continue to be a primary emphasis on nuclear energy because "it is in the greatest jeopardy of not being available when called upon".

Critical Issues:

-electricity and economic growth, nuclear economics, licensing reform, waste transportation, waste bill implementation, the need for nuclear energy.

-effort devoted to each issue depends on the nature of the popular debate, press and public interest and other energy events.

Audiences:

-interested primarily in the general public, with opinion leaders and media considered intermediate targets, and the Congress on special occasions (eg., the nuclear waste bill, CRBR).

Activities:

-purchasing newspaper advertising space to carry messages on specific subjects (eg CRBR, nuclear waste legislation);

-purchasing television time to air "public service messages" on the need for electricity, radiation, nuclear waste (these were test marketed in Grand Rapids Michigan in the spring of 1982, aired in Phoenix, Arizona in late 1983, are currently running in Chicago, Illinois, and planned for several other markets later in 1983. Survey analysis showed a definite positive -- from the industry perspective -- impact on public opinion);

-purchasing magazine advertising space (in 1980/81) for full-page ads in Time, Newsweek, Columbia Journalism Review and Black Enterprise. The series of five ads addressed issues such as nuclear safety, oil vulnerability, the relationship between energy and the economy;

-commissioning the production of films on the jobs and energy link, nuclear power, nuclear reactor operations and on the energy situation. Films are made available to interested groups and in some cases have been offered free of charge and used by local television stations;

-arranging media placement of "third-party" experts who "share our belief that America must wisely develop its domestic energy resources, including nuclear power." USCEA has organized more than 100 media tours to various cities featuring scientists, professors, political leaders and celebrities outside the electric energy industry and estimates that they have reached over 10 million television viewers;

-providing information to citizen and energy advocacy groups by sponsoring an annual citizens advocacy conference, and through a monthly newsletter ("Energy Upbeat" produced by the USCEA) and packages of relevant information (including brochures or papers commissioned by USCEA as well as existing items from AIF, EEI and IAEA);

-supplying news information to media (similar to above information packages);

-sponsoring debates on moral and ethical energy issues:
eg., three La Farge Institute Symposiums on "The Moral
Implications of Energy -- Its Production, Distribution and
Use." The papers from the second symposium appeared in the
October 1981 issue of Catholic Mind magazine which USCEA mailed
to editors, religious leaders, opinion makers, and elected
officials around the country;

-conducting "public attitude research" and occasional
survey analyses through Cambridge Reports;

-assisting in funding the launching of a national public
awareness week on energy called "American Energy Week (AEW)"
held in 1981 and 1982. AEW is now an independent organization
with its next "week" scheduled for the fall of 1983.

Effectiveness:

-the activities of USCEA to date have greatly expanded
the amount of information and pro-nuclear participation in the
nuclear debate; its value is at least implicitly reflected by
its board's decision to increase 1983 funding by seven-fold
over 1982 (primary use of additional funds will be for
advertising). It is too early to determine if the expanded
USCEA will be effective as it has yet to implement its new
program,

ii) The Atomic Industrial Forum

Effort:

AIF has a full time Public Affairs and Information Program separate from its technical division. The PAIP staff numbers 30 (19 professionals) and operates with an annual budget of \$2.2 million. The PAIP program is not supported by AIF membership dues, but is funded separately by specifically designated contributions from member organizations. AIF's membership is composed of about 600 organizations (the largest single group of which is made up of utilities), about 20 percent of which are overseas.

Purpose:

The primary goal of the organization is to serve its members in the commercial nuclear industry deal with issues "by providing information and public relations tools in a timely fashion." In general PAIP's goal is to "promote public understanding of the peaceful uses of commercial nuclear energy," provide the media with balanced information, and help its member deal with the fact that "nuclear critics' organizations have become more widespread and more professional."

Critical issues:

- safety, economics, radiation, waste management, completion of the facilities currently under construction, creation of a climate conducive to future nuclear power plant orders.

Audiences:

- primary audience is the membership, whose audience in turn is generally local press and public (in this manner PAIP can become involved at the specific request of the member in providing information and assistance for such things as state referenda on nuclear topics);

- secondary audiences are those individuals and organizations which impact on general public perception of nuclear energy; this includes journalists. Working with journalists occupies about one-third of PAIP's effort;

- organizations with common interests in the areas of "energy and economic growth" (eg , labor, minority groups etc).

- while AIF does not formally engage in lobbying activities, it does monitor Congressional issues and works with the lobbyists in information development and dissemination.

Activities:

- national mailings to designated public relations liason individuals in member companies; information is generally in response to a significant local or national issue;

-three monthly newsletters -- one each for industry, opinion leaders, and for the press;

-Infowire -- a wire service to provide members with information on nuclear-related events (incidents, accidents, Congressional decisions, press stories, etc.); there are about 200 subscribers to the service (including 16 countries); the service is predicated on the notion that "when an American reactor sneezes the Japanese reactors catch cold"; the purpose of the service is to ensure that when incidents become news there is a means to provide up-to-date facts and perspective in real time;

-Background Info -- issue papers produced on a semi-regular basis to provide information and perspective on issues commanding significant public attention (eg., the Nuclear Waste Policy Act)

-annual statistics surveys -- PAIP surveys and collates data from member organizations on economics, number of plants, construction status, etc.

-news releases -- in addition to responding to particular events with the industry perspective, PAIP produces a semi-annual "state of the industry" release summarizing events of the past six months and prospects for the near future;

-movies -- PAIP has sponsored and coordinated the production of two 30 minute movies on nuclear energy; the films

have won numerous awards and are made available to interested members as well as other organizations on request;

-brochures -- a series of brief, pocket-sized brochures has been produced addressing the full range of nuclear topics from how reactors operate to waste disposal, proliferation, etc.;

-slide library -- PAIP maintains a library of slides of a wide range of nuclear and energy-related topics for use by members, the press or any interested organization (library also includes selected film clips);

-conferences -- PAIP holds an annual public affairs conference for its members

-speeches -- staff regularly travel to present speeches on nuclear topics to industry, civic, local and national organizations;

Effectiveness:

-AIF has established an effective and useful network for information distribution to members (one that is particularly highly regarded by its overseas members); it is generally regarded as the official voice of the commercial nuclear industry and is regularly quoted in the press.

iii) American Nuclear Energy Council

Effort:

ANEC's annual budget is approximately \$1 million, supporting a staff of 15 (10 professionals).

Purpose:

ANEC is the commercial nuclear industry's principal lobbying organization, thus its purpose is to "communicate with the Congress and Administration on policy and legislation that effects nuclear energy."

Critical issues:

-licensing and regulatory reform, CRBR, low-level waste compacts, implementation of the Nuclear Waste Policy Act, transportation of nuclear materials.

Audiences:

-federal decision makers.

Activities:

-bi-monthly meetings for Washington representatives of the commercial nuclear industry where guest speakers

(Congressman, Senators, staffers, appropriate agency officials, etc.) present their views and ANEC helps coordinate industry Congressional activities that are of common interest;

- semi-regular meetings for Washington reps on specific topics; depending on the issues requiring action, there are typically four or five such task forces each addressing the critical issues for that session of Congress (eg., licensing reform, CRBR, transportation of nuclear materials);

- works with Congressional committee staff on specific legislation or testimony;

- holds breakfast or luncheon briefing sessions for legislators and/or Congressional staffers (about one every two months);

- produces and distributes fact sheets on issues of current interest (eg CRBR, uranium import restrictions, waste);

- produces and distributes a weekly newsletter to members.

- holds an annual legislative rally conference (Nuclear Power Assembly) co-sponsored by AIF, CEA, NRECA, APPA.

Effectiveness:

- regards as victories: recent NRC authorization bill addressing the "Sholly amendment" issue, providing interim licensing authority; maintaining CRBR funding; passage of the Nuclear Waste Policy Act.

iv) Nuclear Energy Women

Effort:

While NEW is a national membership organization with about 650 members divided into 15 regions with regional leaders sitting on the NEW Task Force, it is in fact relatively small in both scope and activity level. The Task Force secretary is an AIF staffer (involving a small portion of that individual's time -- and therefore an equally small level of implicit funding from AIF) and all other time is donated by the membership. While NEW is essentially a related part of AIF, it is included as a separate organization because of its focus and semi-independent activities.

Purpose:

NEW was established by the AIF to provide a forum for individual women professionals involved in commercial nuclear energy to share information with other women. The organization was established in recognition of the fact that women tend to be more opposed to nuclear energy than men.

Critical issues:

-essentially the same as AIF.

Audiences:

-national and local women's organizations.

Activities:

- monitoring the interests of the approximately 30 national women's organizations;
- providing information and resources, speakers and tours to those organizations at appropriate times.

v) Institute for Nuclear Power Operations

INPO is included in this listing because its existence as an industry self-appointed safety "watch dog" would most probably affect public opinion in favor of nuclear energy.

INPO has about 5 individuals whose activities involve various forms of public information. All of INPO's activities are directed towards member relations in the form of newsletters and reports. While INPO will respond to media requests for general information, it does not have an active "outreach" program.

INPO was the second of three organizations formed by the commercial nuclear industry following the accident at Three Mile Island (the other two are USCEA, described above, and NSAC, described below). It was established as a technical organization to help utilities "maintain and enhance operations" and to keep members informed of technical

information. INPO has deliberately maintained a low public profile so that its "rhetoric would never get ahead of its performance." INPO's primary agenda is to assist in the safe operation of commercial nuclear plants, and in addition to maintain a high degree of technical credibility with the NRC and nuclear industry. Thus, while public relations programs are not perceived as a part of this activity, nor necessarily beneficial to it, as other organizations (notably AIF, USCEA and EEI) become more vocal about its existence and purpose it could prove to have a significant positive impact on the public perception regarding nuclear safety issues.

vi) Nuclear Safety Analysis Center

NSAC (created at the same time as INPO, as a response to TMI, works closely with INPO) does not have a public relations staff, nor does it have as a part of its operating mandate a PR directive. It is essentially an owners group (reporting to EPRI) that is dedicated to the analysis of technical safety issues of commercial nuclear plants and the dissemination of that information through reports, technical papers, and a national interactive computer-information sharing network called Nuclear Notepad.

Other players in the nuclear debate consider NSAC's existence, like that of INPO, to have a positive effect on public opinion regarding nuclear safety.

2.2 INDUSTRY ORGANIZATIONS WITH A NON-EXCLUSIVE FOCUS ON
NUCLEAR ENERGY

- i) Edison Electric Institute
- ii) National Rural Electric Cooperative Association
- iii) American Public Power Association
- iv) Electric Power Research Institute

i) Edison Electric Institute

Effort:

EEI has a full time public affairs staff of about 30 individuals; nuclear energy information occupies about 20 percent of staff time during a year. (These activities are left primarily to USCEA and AIF.) In addition, two individuals within the government affairs department have full time nuclear-related lobbying responsibilities. EEI's members provide its \$18 million in annual dues (equal to 25 cents/year per customer served by member utilities).

Purpose:

EEI's public affairs staff was established to serve its utility members and press requests for information.

Critical issues:

-TMI clean-up, regulatory reform, waste bill implementation, waste transportation, CRBR.

Audiences:

-EEI members, opinion leaders, media, legislators, appropriate labor groups, citizen organizations, and academics.

Activities:

-brochures -- Q&A booklet on nuclear issues, electricity, electric rates, alternative energy sources, environment issues, etc.;

-advertising -- focussed on Washington D.C. audience in support of government affairs activities;

-conferences for members;

-editorial round tables -- about 50 round tables per year between utility executives and editorial boards of publications.

ii) National Rural Electric Cooperative Association

Effort:

NRECA has at most two individuals involved in public relations efforts as well as seven lobbyists who become

involved in nuclear issues at appropriate times.

Purpose:

NRECA has about 1000 member organizations. Its primary purpose is to serve those members. A major portion of NRECA's staff is not supported by general dues, rather by funds collected from members participating in specific activities or programs (eg , insurance, management workshops). The Public and Association Affairs division defers most requests for public information on nuclear matters to AIF and USCEA. Only 20 systems in NRECA's membership have part ownership in a nuclear generating station.

Critical issues:

-as they relate to nuclear energy: waste bill, CRBR, licensing reform;

Audiences:

-membership, Congress:

Activities:

-periodicals and newsletters (which occassionally address nuclear topics);

-annual legislative rally in Washington D.C. held in conjunction with Nuclear Power Assembly which they also co-sponsor (see ANEC).

iii) American Public Power Association

Effort:

APPA has a public information staff consisting of two people and a government relations staff of six. APPA does not receive many questions regarding commercial nuclear energy -- when it does individuals are referred to AIF-- and thus has essentially no sustained nuclear information activities. APPA does take legislative positions with regards to nuclear issues and lobby those position in Congress.

Purpose:

APPA represents 1750 local publicly owned utilities, many of which have a shared ownership in a nuclear generating station.

Critical issues:

-improving the licensing process, waste, funding TMI clean-up, CRBR, reprocessing.

Audiences:

-members, regulators and legislators

Activities:

-newsletter, monthly magazine.

iv) Electric Power Research Institute

Effort:

EPRI has a communications division staff of 27, with an additional three individuals located in Washington D.C.

Purpose:

EPRI's public information is oriented towards the dissemination of the results of its research programs. No more than 20 percent of this information is nuclear-related. While it is not a part of EPRI's charter to engage in public relations efforts regarding any energy source, the public disclosure of research efforts at EPRI could produce a positive response in the public climate regarding commercial nuclear energy. at the very least because the organization is a respected research institute and its activities would reassure the public that scientists are involved in the issues.

Critical issues:

-these are defined by research activities (eg., safety, fuel management, nuclear operations, etc.);

Audiences:

-industry, media.

Activities (which include, but do not necessarily focus on nuclear programs):

-technical reports and summaries; occasional press conference; monthly EPRI journal; brochures for non-technical audiences; video tapes and films on EPRI programs; press tours of EPRI operated facilities; occasionally called on to provide Congressional testimony on technical issues.

2.3 INDUSTRY ORGANIZATIONS WITH AN INVOLUNTARY OR IMPLICIT IMPACT ON PUBLIC OPINION

- i) The manufacturers and architect/engineers.
- ii) The utilities.

This category includes organizations that do not have a national public information program, but that have contributed to the formation of public opinion involuntarily (eg., Babcock & Wilcox following TMI, or Stone & Webster following the pipe bracket supporting incident in early 1979). While organizations in this category may not have programs to attempt to positively affect public opinion (the mandate of this paper), neither do they intend to have a negative effect (and therefore would not be included in OTA's analog study on anti-nuclear organizations). Yet, the existence and actions of

these organizations does have an impact on public opinion.

i) The manufacturers and architect/engineers

The industries in this category rely primarily on the associations for national public information efforts. A few of these organizations were contacted to determine the level and nature of any national public relations efforts.

General Electric: GE has two people dedicated to national public relations activities and about five others that can be utilized on special occasions. The GE approach is not to engage directly in publicity efforts, but rather to work with existing organizations (most prominently USCEA and ANS).

Stone & Webster: S&W has a full time national public relations staff of three (one in Washington D.C.) with one additional person assigned to congressional relations. S&W views its primary purpose as the design and construction of any power-producing facility, and service for existing facilities. As such it devotes most of its limited efforts towards its clients and to the support of other nuclear industry institutional public affairs activities.

Westinghouse: Westinghouse has fewer than a dozen people in all areas that are engaged in some way with national level public relations activities. Its efforts are directed

primarily towards education including the production of educational materials. Westinghouse runs an editorial roundtable series (about 12 per year) using in-house experts, sponsors an education program for the General Federation of Women's Clubs, places Westinghouse spokespeople on talk shows, and has a speakers bureau that responds to requests from civic organizations and schools.

ii) The utilities

Utility's do not engage in the national nuclear debate intentionally -- this is the responsibility of AIF, USCEA and EEI. (Local PR programs do not have national impact.) However, those utilities that have had difficulties, cost over-runs, accidents, etc., are often the subject of national news and thus significantly contribute to a negative public image about commercial nuclear energy. It is a common complaint of the nuclear industry that the reliable and successful operation of the vast majority of the generating stations is not news. However, this is no different than for any other industry where problems are news, not normal operations. Utilities that have faced problems that were national news include: PSNH (Seabrook), LILCO (Shoreham), TVA (Browns Ferry), PG&E (Diablo Canyon), Florida Power & Light (Crystal River), Central Maine Power (Maine Yankee), PASNE (Indian Point), and WPSS.

SECTION 3.0

PROFESSIONAL SOCIETIES

Introduction

None of the professional societies have public relations efforts of the same scope as industry. However, some of them are engaged in efforts designed specifically to provide the public with facts -- educational efforts -- and all of them have an interest in presenting their views on either nuclear energy or technical subjects relating to it.

3.1 PROFESSIONAL SOCIETIES WITH A PRIMARY FOCUS ON NUCLEAR ENERGY

- i) American Nuclear Society
- ii) American Nuclear Science Teachers Association

i) American Nuclear Society

Effort:

ANS expects a 1983 public education budget of about \$800,000. (The budget was typically \$250,000 a year before the

accident at Three Mile Island.) ANS has a Public Education Committee and staff assigned to such activities in the association offices in Chicago.

Purpose:

ANS is a professional society with some 13,000 individual members from industry, government and academia in 58 local chapters. It also has 56 student chapters around the country. While the primary purpose of ANS is similar to any professional society -- professional journals, meetings, etc. -- the board has decided in recent years that the organization must do more than "talk to themselves." ANS views education of the public as its primary objective.

Critical issues:

-the need for nuclear, safety, radiation, waste, economics.

Audiences:

-schools, Congress (occasionally), state legislators, regulators, civic organizations, media.

Activities:

-position papers, brochures, slide shows, briefings (state and federal legislators), testimony.

ii) American Nuclear Science Teachers Association

Effort:

ANSTA derives all of its support from members' donated time.

Purpose:

ANSTA was launched in 1972 in the state of Pennsylvania, became national in 1976 (although it still has a modest membership of 60 and a "mailing list" of 400) with the stated purpose of promoting communications concerning nuclear science education and providing teachers with opportunities to keep informed about new developments in nuclear theory and technology.

Critical issues:

-nuclear science and technology education.

Audiences:

-teachers, local civic organizations.

Activities:

-annual meeting, membership newsletter, responding to local community requests for information and speeches;
-currently planning a national drive to expand membership.

3.2 PROFESSIONAL SOCIETIES WITH A NON-EXCLUSIVE FOCUS ON
NUCLEAR ENERGY

- i) Health Physics Society
- ii) American Association of Engineering Societies
- iii) Institute of Electrical and Electronics Engineers

i) Health Physics Society

Effort:

While HPS has an annual operating budget of about \$350,000, public information activities are primarily managed and directed at the local level. Activities are coordinated by the Public Information Committee. Effort comes from donated member time.

Purpose:

HPS is a professional society with 5,600 members from the radiation protection community in industry, government and academia. It publishes a professional journal and newsletter. Public information activities are limited (although there is a strong interest in expansion) and directed towards education on radiation topics.

Critical issues:

-radiation

Audiences:

-local and civic organizations, schools.

Activities:

-a slide show kit is used by members to give lectures on radiation;

-newsletter for members addresses public information topics.

ii) American Association of Engineering Societies

Effort:

The Coordinating Committee on Energy is composed of 21 individuals representing the technical societies of the AAES. The CCE has a staff secretary (whose time is donated by ASME) and a budget of about \$10,000 primarily for printing expenses. The CCE has Washington D.C. representation part-time under the auspices of two ASME employees.

Purpose:

- to keep decision leaders and the public informed of the long-range importance of energy and the problems surrounding assuring supply;

Critical issues:

- importance of energy supply, need for nuclear, waste, CRBR.

Audiences:

- opinion leaders (lack the resources to target general public), Congress.

Activities:

- producing and issuing position papers (eg., on energy, nuclear waste, CRBR) with associated press releases;
- congressional staff briefings;
- congressional testimony;
- CCE members have a strong interest in increasing activities and effectiveness.

iii) Institute of Electrical and Electronics Engineers

Effort:

The IEEE's Energy Committee has about 45 representatives. The staff secretary of the committee functions only part time in that capacity. The committee had a 1982 budget of \$18,000 (almost entirely used for an energy slide show). All time devoted to public efforts is donated by members involved.

Purpose:

-to provide information and education on energy topics.

Critical issues:

-energy supply and economics, environment, nuclear waste.

Audiences:

-primarily congressional.

Activities:

-production and distribution of an exhaustive energy slide show;

-submission of technical comments and testimony on nuclear waste legislation (this was the first time that the Professional Activities Committee of the IEEE endorsed a

lobbying position on a technical issue -- previous lobbying efforts have been restricted to engineering personnel issues);

-issuing of policy papers (endorsed by the board of the IEEE) on such topics as conservation, nuclear energy, electricity, breeder reactors.

3.3 PROFESSIONAL SOCIETIES WITH AN INDIRECT FOCUS ON NUCLEAR ENERGY

- i) American College of Nuclear Physicians
- ii) American Physical Society

i) American College of Nuclear Physicians

Effort:

ACNP has been awarded a DOE grant to engage in public education activities, in addition to receiving some funds from a variety of other sources. Educational Coordination is handled by a professional association management organization (involving part-time activities of one individual).

Purpose:

The ACNP has 1200 member physicians and is primarily interested in providing educational information and speakers. To the extent that their activities goes towards alleviating public concern regarding radiation, it could be considered as being indirectly beneficial to the pro-nuclear community.

Critical issues:

- radiation in medicine (risks and benefits), low-level waste disposal.

Audiences:

- civic organizations, colleges, public schools
- other associations
- radio, TV

Activities:

- a speakers bureau composed of 80 doctors;
- slide show for use by speakers;
- newsletter for members;
- brochure on "What is nuclear medicine";
- seminars (for speaker training).

ii) American Physical Society

Effort:

In early 1983 APS established a Washington D.C.-based public affairs office staffed by three people (all part time).

Purpose:

-to inform membership of important public policy activities and to provide a conduit for society opinion to reach decision leaders.

While the APS does not engage in public relations efforts of any kind, or specifically choose to become involved in the nuclear debate (although its review of the so-called Rasumussen Study gathered significant national press coverage and created significant debate), its past activities have made it an involuntary player. The APS review of the state of science and technology regarding nuclear waste disposal has been a significant tool used by others in the pro-nuclear community. Because of the nature and respect the organization commands, any future activities in energy or nuclear-related areas have potential for public impact.

SECTION 4.0

CITIZEN OR NON-INDUSTRY ORGANIZATIONS

Introduction

With two exceptions, the non-aligned groups do not have a specific focus on nuclear energy or the debate surrounding it. However, when these types of organizations take public policy positions in favor of commercial nuclear energy in general, or specific related issues, they probably impact public opinion. This is attributed to the fact that they have no vestiture in the enterprise.

4.1 CITIZENS GROUPS OR NON-INDUSTRY ORGANIZATIONS WITH A PRIMARY FOCUS ON NUCLEAR ENERGY

- i) Americans For Nuclear Energy
- ii) Scientists and Engineers for Secure Energy

i) Americans For Nuclear Energy

Effort:

AFNE depends primarily on donated time from its members. Its activities are supported entirely without nuclear industry funds through its 20,000 members. (Budget figures not made available.)

Purpose:

- "to show Congress a broad base of public support for continued and enhanced use of nuclear energy."

Critical issues:

- passage of nuclear waste legislation, licensing reform, reprocessing of spent fuel, CRBR;

- "the need to make the public aware of the need for and safety of nuclear energy."

Audiences:

- Congress and congressional staff.

Activities:

- seminars for Congressmen and staff;

- newsletter for members;

- a general information package for direct mail fund-raising efforts;

- distribution of reprints of articles on nuclear energy.

ii) Scientists and Engineers for Secure Energy

Effort:

SE2 has a New York City based staff of five, and one person each in Washington D.C. and San Francisco. It depends on significant amounts of volunteer time from its approximately 1,000 scientific and engineering membership. (While budget figures were not made available, information published in the March 2, 1983 issue of Chemical Week states that SE2 received a \$100,000 grant from DOE for "campus energy forums" for 1983, and that its average annual budget has been at least \$250,000.)

Purpose:

SE2 is "dedicated to the prudent advancement of the use of technology for the benefit of mankind." It was originally established to provide a "non-vested" perspective on nuclear topics in the public debate.

Critical issues:

-waste, licensing reform, CRBR, reprocessing, TMI clean-up, nuclear insurance, energy policy.

Audiences:

-Congress, state legislators, press, universities, general public.

Activities:

- member newsletter;
- intervention in local, state and federal regulatory proceedings (eg., NRC and licensing, siting issues, CRBR, Indian Point 2&3, West Valley reprocessing, radioactive materials transportation with FEMA, EPA, DOE and DOT);
- participate (as amicus curiae) in court proceedings on nuclear topics (eg., Consumers Power, Vermont Yankee Supreme Court cases);
- contact and provide information to key federal agency and administration officials;
- sponsored two conferences on energy issues;
- sponsoring, organizing Campus Energy Forum series -- public meetings featuring prominent scientists held at university and college campuses around the country;
- a Committee on Regulatory Assessment to evaluate and provide advice on federal actions to improve licensing process (composed of SE2 members);
- a Committee on Technological Safety to evaluate and provide advice on risk assessment and safety goals.

4.2 CITIZEN OR NON-INDUSTRY ORGANIZATIONS WITH A
NON-EXCLUSIVE FOCUS ON NUCLEAR ENERGY

- i) Americans for Energy Independence
- ii) Youth for Energy Independence
- iii) American Association of Blacks in Energy
- iv) Women in Energy
- v) AFL-CIO

i) Americans For Energy Independence

Effort:

AFEI has a staff of seven (3 full-time professionals) and an annual budget of less than \$400,000.

Purpose:

-promote remedies to U.S. energy dependence by recommending solutions that reduce reliance on oil (nuclear energy considered a part of this mix).

Critical issues:

-energy dependence, improving energy efficiency, conservation, greater diversification of energy sources, R&D on new energy technologies, need for nuclear energy.

Audiences:

-those involved in making policy decisions -- public officials, media, leaders in citizen organizations.

Activities:

-produces technical information on energy topics;
-seminars, conferences with members of Congress and staff, reports, boards of civic organizations.

ii) Youth for Energy Independence

Effort:

YEI has a three person Washington D.C. staff and 18 campus chapters. (Budget figures not provided.)

Purpose:

The Board of Directors is a coalition of individuals in the business and scientific community, organized labor, and national youth organizations. It is a bi-partisan, non-profit coalition that advocates energy policies that are "for economic growth, national security and social opportunity."

Critical issues:

-economic growth, energy security, safe nuclear power.

Audiences:

-students.

Activities:

-campus oriented programs involving educational forums, sponsoring discussions and debates, tours, training seminars for campus representatives.

iii) American Association of Blacks in Energy

Effort:

Primarily donated time for the national membership of 350 individuals. (Essentially no budget, all donated time by professionals employed in energy-related positions.)

Purpose:

-"to ensure that black Americans are involved in public debate involving energy policy."

Critical issues:

-national issues regarding energy policy with occasional, when appropriate, focus on nuclear energy (eg., need for, waste bill, safety, CRBR).

Audiences:

- legislative, administrative and regulatory branches of federal government;
- energy industry.

Activities:

- annual conference;
- participates in seminars and workshops held by other organizations;
- works closely with National Urban League, NAACP, National Environmental Development Association;
- NABE board endorsed nuclear waste bill, CRBR (board decisions are based on member surveys);
- newsletter.

iv) AFL-CIO

The past AFL-CIO endorsement of commercial nuclear energy, and in particular the strong support from the Building and Construction Trades, has been an important component of the pro-nuclear public posture. While labor does not generally engage in public relations activities in support of nuclear energy, the support of unions is perceived by the pro-nuclear community as critical.

SECTION 5.0

OTHER ORGANIZATIONS AND INDIVIDUALS

A discussion of the players which can influence public opinion in favor of nuclear energy would not be complete without mention of the Department of Energy, the Nuclear Regulatory Commission, the National Commission on Radiological Protection, the National Academy of Sciences, and the federal government at large.

○ DOE does not have a sustained, or at least visible, public relations effort to promote nuclear energy. It does respond to public requests for information or speakers and clearly has a desire to support a technology that constitutes the largest single share of its current budget. DOE also provides funds to encourage educational activities in areas of its interest (see for example Section 3.3, the ACNP, and Section 4.1 SE2).

○ The NRC's mandate does not provide for any public relations activities. However, one could construe its role in the regulation of safety matters as generally providing a climate for improved public support of nuclear energy because it is a highly visible public agency (appearing almost weekly

in news stories regarding utilities) and because surveys show that the public feels more comfortable with nuclear power plants when the safety regulators are doing their job.

○ The NCRP also does not engage in public activities. However, its exhaustive studies and documentation on radiation topics is of significance for that component of the pro-nuclear community engaged in public discussion of those topics. This is especially important considering the concern regarding radiation and the high credibility of the NCRP.

○ The National Academy of Sciences is important with regard to public opinion again only insofar as its deliberations and information are used by others in the public debate. The NAS has produced numerous studies of importance, the most recent and relevant being "Energy in Transition 1985 - 2010" which provided a strong endorsement for the use of commercial nuclear energy. In addition, the NAS's Committee on the Biological Effects of Ionizing Radiation provides the most comprehensive and widely used guidelines and information on radiation in the U.S. The BEIR report is generally regarded by the pro-nuclear community as being helpful to its contention that the radiation risks from commercial nuclear energy are minimal and manageable.

○ The posture of both the Congress and the Administration is important regarding the public's perception of nuclear energy. Generally speaking, the actions and legislation arising from Congress are regarded as "pro-nuclear".* With regard to Congress, however, it is the posture and the mood of constituents and their representatives that strongly determines the success of legislation that is considered pro-nuclear. As for the Administrative branch, clearly the posture here is important from the perspective of the pro-nuclear community. That community generally regarded the Carter Administration as cool, at best, towards commercial nuclear energy and the Reagan Administration as pro-nuclear. It is not clear what impact this has on public opinion though, since many members of the public regard such positions as more political than substantive.

*see "Nuclear Peril: The Politics of Proliferation,"
Congressman Ed Markey, Ballinger Books.

SECTION 6.0

ORGANIZATIONS IDENTIFIED

<u>Section</u>	<u>Organization</u>
2.1	U.S. Committee for Energy Awareness Atomic Industrial Forum American Nuclear Energy Council Nuclear Energy Women Institute for Nuclear Power Operations Nuclear Safety Analysis Center
2.2	Edison Electric Institute National Rural Electric Cooperative Association American Public Power Association Electric Power Research Institute
2.3	Architect/Engineers - Manufacturers Utilities
3.1	American Nuclear Society Nuclear Science Teachers Association
3.2	Health Physics Society American Association of Engineering Societies Institute of Electrical and Electronics Engineers
3.3	American College of Nuclear Physicians American Physical Society
4.1	Americans For Nuclear Energy Scientists and Engineers for Secure Energy
4.2	Americans For Energy Independence Youth for Energy Independence American Association of Blacks in Energy AFL-CIO

SECTION 7.0

ATTACHMENTS

Samples of public information materials, reports or positions on nuclear energy were received from a large number of the organizations interviewed for this paper. The attachments include samples of some of this material from the following organizations:

<u>Section</u>	<u>Organization</u>
2.1	U.S. Committee for Energy Awareness Atomic Industrial Forum Nuclear Energy Women
2.2	Edison Electric Institute American Public Power Association Electric Power Research Institute
3.1	American Nuclear Society
3.2	American Association of Engineering Societies Institute of Electrical and Electronics Engineers
3.3	American College of Nuclear Physicians
4.1	Americans For Nuclear Energy Scientists and Engineers for Secure Energy
4.2	Americans For Energy Independence